Serial
A
v. 13-14
1873-74
cop. 1

Columbia University
in the City of New York

School of Dental and Oral Surgery

LIBRARY OF
DR. CARL F. W. BÖDECKER
1846-1912
The gift of
Dr. Henry and Dr. Charles Bödecker
1929

Historical Collection

TRANSACTIONS

OF THE

American Dental Association

AT THE

THIRTEENTH ANNUAL SESSION,

HELD AT PUT-IN-BAY,

COMMENCING AUGUST 5TH, 1873.

PUBLICATION COMMITTEE.

M. S. DEAN, G. H. CUSHING, H. A. SMITH.

CHICAGO:
KNIGHT & LEONARD, PRINTERS.
1873.

DISCLAIMER.

The American Dental Association, although formally accepting and publishing the reports of the various Standing Committees, and the essays read before the Association, holds itself wholly irresponsible for the opinions, theories, or criticisms therein contained, except when otherwise decided by special resolution. — *Constitution.*

OFFICERS, 1872–73.

PRESIDENT.

P. G. C. HUNT, - - - - INDIANAPOLIS.

FIRST VICE-PRESIDENT.

L. D. SHEPARD, - - - - BOSTON.

SECOND VICE-PRESIDENT.

G. A. MILLS, - - - - BROOKLYN.

CORRESPONDING SECRETARY.

J. TAFT, - - - - - CINCINNATI.

RECORDING SECRETARY.

M. S. DEAN, - - - - CHICAGO.

TREASURER.

W. H. GODDARD, - - - - LOUISVILLE.

EXECUTIVE COMMITTEE.

G. H. CUSHING, J. TAFT,
J. S. KNAPP, A. B. ROBBINS,
G. B. MCDONNELD, S. B. PALMER,
L. D. SHEPARD, H. A. SMITH,
S. H. MCCALL.

OFFICERS, 1873–74.

PRESIDENT.

T. L. BUCKINGHAM, - - - PHILADELPHIA.

FIRST VICE-PRESIDENT.

ISAIAH FORBES, - - - ST. LOUIS.

SECOND VICE-PRESIDENT.

A. F. McLAIN, - - - - NEW ORLEANS.

CORRESPONDING SECRETARY.

J. TAFT, - - - - - CINCINNATI.

RECORDING SECRETARY.

M. S. DEAN, - - - - CHICAGO.

TREASURER.

W. H. GODDARD, - - - LOUISVILLE.

EXECUTIVE COMMITTEE.

G. H. CUSHING,
G. B. McDONNELD,
L. D. SHEPARD,
GEO. L. FIELD,
A. B. ROBBINS,
S. B. PALMER,
H. A. SMITH,
G. R. THOMAS.

CONTENTS.

Minutes of the Secretary, - - - - - - - - - - 9
Roll-call of permanent members, - - - - - - - - 9
Absent members who sent dues, - - - - - - - - - 10
Delegates made permanent members, - - - - - - - 11
Report of Committee on Credentials, - - - - - - - - 12
Societies and colleges represented, - - - - - - - - 12
Action on amendments to the constitution, - - - - - - - 13
Rescinding resolution in regard to dues, - - - - - - - 13
Hours of meeting during the session, - - - - - - - - 14
Committee on Popular Education, - - - - - - - - 15
Report of Executive Committee, in regard to clinics, - - - - 15
Resolution instructing Committee on Therapeutics, - - - - 16
Chairman *pro tem.* appointed, - - - - - - - - - 16
Resolution disapproving policy of railroad officials, - - - - 16
Resolution — appointment of dentists in army and navy, - - - 17
Resolution of thanks — railroads, - - - - - - - - 17
Report of Auditing Committee, - - - - - - - - - 17
Election of officers, and next place of meeting, - - - - - 18
Appointment of Publication Committee, - - - - - - - 19
Presentation of gold medal to Dr. Barnum, - - - - - - 19
Resolution and Committee — protect interest of dentists, - - - 20
Standing Committees, - - - - - - - - - - - 21
Report of Treasurer, - - - - - - - - - - - - 21
Resolution in reference to payment of orders drawn on Treasurer, - 22
Resolution authorizing printing of 500 copies of constitution, - - 22
Adoption of amendment to Art. IX, constitution, - - - - - 22
Proposed amendment to constitution, - - - - - - - - 22
Committee — Barnum testimonial fund, - - - - - - - 22
Amended constitution, - - - - - - - - - - - - 25
Code of ethics, - - - - - - - - - - - - - 34

REPORTS OF STANDING COMMITTEES, AND VOLUNTEER ESSAYS.

Report on Dental Physiology — M. S. Dean, - - - - - - - 39
Report on Pathology and Surgery — H. Judd, - - - - - - 50
Report on Pathology and Surgery — H. S. Chase, - - - - - - 65

Report on Dental Therapeutics — H. L. Sage, - - - - - - 79
Report on Dental Chemistry — M. H. Webb, - - - - - - 100
Report on Dental Histology and Microscopy — T. B. Hitchcock, - - 116
Report on Dental Education — W. H. Morgan, - - - - - - 159
Report on Dental Education — E. J. Waye, - - - - - - 161
Report on Dental Literature — G. H. Cushing, - - - - - - 165
Report on Dental Literature — E. A. Bogue, - - - - - - 177
Report on Mechanical Dentistry — W. M. Herriott, - - - - - 188
Report on Mechanical Dentistry — W. H. Eames, - - - - - 191
Report on Etiology — S. B. Brown, - - - - - - - - - 195
Essay on Histology and Microscopy — W. H. Atkinson, - - - - 141
Remarks on the status of dentistry in China — W. C. Eastlack, - - 198
Presentation speech to Dr. Barnum — C. C. Knowles, - - - - 113
Reports on Local Societies — Judd, Taft, and Atkinson, - - - - 200

Discussions.

Pathology and Surgery — discussed by
Dr. Atkinson, - - - - - - - - - - - - 61, 74
Dr. Judd, - - - - - - - - - - - - 64, 73, 77, 78
Dr. Chase, - - - - - - - - - - - - - 75, 77, 78
Dr. Abbott, - - - - - - - - - - - - - 75
Dr. Walker, - - - - - - - - - - - - - - 76
Dr. Morgan, - - - - - - - - - - - - - 76
Dr. Herriott, - - - - - - - - - - - - - 77
Dr. Osmond, - - - - - - - - - - - - 76, 77
Dr. Buckingham, - - - - - - - - - - - - 77
Dr. Stellwagen, - - - - - - - - - - - - 77, 78
Dr. Smith, - - - - - - - - - - - - - 78
Dental Therapeutics — discussed by
Dr. Atkinson, - - - - - - - - - - - 104, 105
Dr. Buckingham, - - - - - - - - - - 104, 105, 108
Dr. Summers, - - - - - - - - - - - 105, 106
Dr. Taft, - - - - - - - - - - - - 105, 108
Dr. Osmond, - - - - - - - - - - - 105, 106, 108
Dr. Douglass, - - - - - - - - - - - 106, 109
Dr. Hitchcock, - - - - - - - - - - 106, 108, 109
Dr. Stellwagen, - - - - - - - - - - - - 107
Dr. Hunter, - - - - - - - - - - - - - 108
Dr. Rehwinkel, - - - - - - - - - - - - 108
Dr. Whitney, - - - - - - - - - - - - - 108
Dr. Forbes, - - - - - - - - - - - - - 109
Operative Dentistry — discussed by
Dr. Hitchcock, - - - - - - - - - - - 110, 111
Dr. Judd, - - - - - - - - - - - - 110, 111, 114
Dr. Stellwagen, - - - - - - - - - - - 111, 115

Operative Dentistry — discussed by
Dr. Herriott, - - - - - - - - - - - - 111, 112
Dr. Carroll, - - - - - - - - - - - - 112, 114
Dr. McDonneld, - - - - - - - - - - - - 112, 114
Dr. Eames, - - - - - - - - - - - - - 112
Dr. Taft, - - - - - - - - - - - - 112, 115
Dr. Knapp, - - - - - - - - - - - - 112, 114
Dr. Morgan, - - - - - - - - - - - - 114
Dr. Forbes, - - - - - - - - - - - - - 114
Dr. Chupein, - - - - - - - - - - - - 114
Histology and Microscopy — discussed by
Dr. Judd, - - - - - - - - - - - - - 139
Dr. Hitchcock, - - - - - - - - - - - - 139
Dr. Morgan, - - - - - - - - - - - - 139
Dr. Atkinson, - - - - - - - - - - - - 139
Dr. Smith, - - - - - - - - - - - - 140
Dr. Chase, - - - - - - - - - - - - - 140
Dental Literature — discussed by
Dr. Morgan, - - - - - - - - - - - - - 182
Dr. Atkinson, - - - - - - - - - - - - 183
Dr. Thomas, - - - - - - - - - - - - - 183
Dr. Hitchcock, - - - - - - - - - - - - 183
Dr. Wright, - - - - - - - - - - - - 185, 187
Dr. Stellwagen, - - - - - - - - - - - - 185
Dr. Taft, - - - - - - - - - - - - 186, 187
Dr. Herriott, - - - - - - - - - - - - 187
Dr. Judd, - - - - - - - - - - - - - 187
Dental Etiology — discussed by
Dr. Judd, - - - - - - - - - - - - - 198

MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION.

By M. S. DEAN, Secretary.

THE American Dental Association commenced its Thirteenth Annual Session in Beebe House Hall, at Put-in-Bay, Ohio, August 5, 1873, at 10:30 A. M.; the President, P. G. C. Hunt, in the chair.

The meeting was opened with prayer by the Rev. G. Bosley, of Put-in-Bay.

On roll-call, the following permanent members, having paid their dues for the year 1873, were present:

W. H. Goddard,	Louisville, Ky.
J. Taft,	Cincinnati, O.
P. G. C. Hunt,	Indianapolis, Ind.
Homer Judd,	St. Louis, Mo.
T. L. Buckingham,	Philadelphia.
E. Honsinger,	Chicago, Ill.
G. F. S. Wright,	Pomaria, S. C.
A. W. Harlan,	Chicago, Ill.
M. S. Dean,	Chicago, Ill.
M. L. Chaim,	New York.
W. H. Eames,	St. Louis, Mo.
Geo. H. Cushing,	Chicago, Ill.
H. A. Smith,	Cincinnati, O.
D. B. Freeman,	Chicago, Ill.
H. L. Sage,	Bridgeport, Conn.

G. B. McDONNELD, - - - - - - - - Coneautville, Pa.
W. T. WALLACE, - - - - - - - - Kingsville, O.
SENECA B. BROWN, - - - - - - - - Fort Wayne, Ind.
W. C. DYER, - - - - - - - - - Chicago, Ill.
A. E. LYMAN, - - - - - - - - Warren, O.
F. S. WHITSLAR, - - - - - - - - Youngstown, O.
C. FONES, - - - - - - - - - Bridgeport, Conn.
W. M. HERRIOTT, - - - - - - - - Zanesville, O.
EDMUND OSMOND, - - - - - - - - Cincinnati, O.
FRANK ABBOTT, - - - - - - - - New York.
G. C. DABOLL, - - - - - - - - Buffalo, N. Y.
S. H. MCCALL, - - - - - - - - Binghampton, N. Y.
H. S. CHASE, - - - - - - - - St. Louis, Mo.
G. R. THOMAS, - - - - - - - - Detroit, Mich.
F. HERRIOTT, - - - - - - - - Zanesville, O.
G. W. KEELY, - - - - - - - - Oxford, O.
J. W. BAXTER, - - - - - - - - Vevay, Ind.
M. H. WEBB, - - - - - - - - Lancaster, Pa.
W. H. MORGAN, - - - - - - - - Nashville, Tenn.
CHAS. E. DUNN, - - - - - - - - Louisville, Ky.
B. T. SPELLMAN, - - - - - - - - Detroit, Mich.
CORYDON PALMER, - - - - - - - - Warren, O.
B. OSCAR DOYLE, - - - - - - - - Louisville, Ky.
JOHN C. WYMAN, - - - - - - - - Brooklyn, N. Y.
W. H. ATKINSON, - - - - - - - - New York.
J. R. WALKER, - - - - - - - - New Orleans.
F. J. RICHARDS, - - - - - - - - Williamsport, Pa.
G. W. KLUMP, - - - - - - - - Williamsport, Pa.
J. C. WHINERY, - - - - - - - - Salem, Ohio.
ISAIAH FORBES, - - - - - - - - St. Louis, Mo.
D. W. CLANCEY, - - - - - - - - Cincinnati, O.
E. S. HOLMES, - - - - - - - - Gr. Rapids, Mich.
CHAS. R. BUTLER, - - - - - - - - Cleveland, O.
G. L. FIELD, - - - - - - - - Detroit, Mich.
W. G. CUMMINGS, - - - - - - - - Sturgis, Mich.
J. A. W. DAVIS, - - - - - - - - Chicago, Ill.
C. H. BIDDLE, - - - - - - - - Brooklyn, N. Y.
E. J. WAYE, - - - - - - - - Sandusky, O.
C. C. CARROLL, - - - - - - - - Meadville, Pa.
E. F. DAVIS, - - - - - - - - Galesburg, Ill.

The following members, being absent, forwarded their dues:

W. W. ALLPORT, - - - - - - - - Chicago.
S. A. FREEMAN, - - - - - - - - Buffalo, N. Y.
J. N. SCRANTON, - - - - - - - - Bennington, Vt.

C. W. Stainton,	Buffalo, N. Y.
J. H. McQuillen,	Philadelphia.
Aaron Colton,	Hudson, N. Y.
J. J. Birge,	San Francisco, Cal.
J. N. Crouse,	Chicago, Ill.
S. W. Dennis,	San Francisco, Cal.
Wm. Dutch,	San Francisco, Cal.
J. F. Canine,	Louisville, Ky.
H. B. Noble,	Washington, D. C.
F. Peabody,	Louisville, Ky.
L. D. Shepard,	Boston, Mass.
J. S. Hill,	Gettysburg, Pa.
E. A. Bogue,	New York.
C. D. Cook,	Brooklyn, N. Y.
C. F. Wheeler,	Albany, N. Y.
S. B. Palmer,	Syracuse, N. Y.

New members, who signified their wish to become permanent:

J. E. Low,	Chicago, Ill.
Jas. E. Johnstone,	Staunton, Va.
E. D. Swain,	Chicago, Ill.
C. C. Knowles,	San Francisco, Cal.
I. Knapp,	Fort Wayne, Ind.
L. Buffett,	Cleveland, O.
J. E. Robinson,	Cleveland, O.
I. Douglass,	Romeo, Mich.
E. Hunter,	Manchester, Mich.
J. M. Austin,	St. Joseph, Mo.
W. P. Hall,	
A. F. McLain,	New Orleans, La.
J. F. Thompson,	Chicago, Ill.
C. H. Darby,	St. Joseph, Mo.

The reading of the minutes of the preceding year was called for, and, on motion, omitted.

On motion of Dr. Cushing, the Treasurer called the names of those whose credentials had been passed upon, but who had not paid their dues.

Dr. Cushing, chairman of the Committee on Credentials, made a partial report of the members whose credentials were found satisfactory, which was accepted and adopted:

Subsequently the same committee reported the names of qualified delegates, and the associations by which they were appointed, as follows:

California State Dental Association — C. C. Knowles.
Pennsylvania Association of Dental Surgeons — Spencer Roberts.
Pennsylvania State Dental Society — G. B. McDonnell, M. H. Webb, J. L. Smith.
Pennsylvania College of Dental Surgery — T. L. Buckingham.
Chicago Dental Society — M. S. Dean, A. W. Harlan, Geo. H. Cushing, E. D. Swain, W. C. Dyer.
Illinois State Dental Society — J. E. Low, E. Honsinger, D. B. Freeman.
Southern Dental Association — Jas. Johnstone, Theo. F. Chupein.
Connecticut State Dental Association — H. L. Sage.
St. Louis Dental Society — G. A. Bowman.
Northern Ohio Dental Association — J. E. Robinson, L. Buffett, F. S. Whitslar, B. Strickland.
Kentucky State Dental Association — W. H. Goddard, B. Oscar Doyle, Chas. E. Dunn, G. W. Priest.
Sixth District Dental Society of New York — S. H. McCall.
Indiana State Dental Association — J. W. Baxter, I. Knapp, R. H. Clayton, J. K. Jameson, S. B. Brown, B. P. McDonald, W. F. Morrill.
Michigan Dental Association — G. E. Corbin, I. Douglass, E. Hunter.
Forest City Society of Dental Surgeons — Chas. Buffett.
Ohio Dental College Association — W. G. Redman.
Philadelphia Dental College — T. C. Stellwagen.
Missouri State Dental Association — J. M. Austen, W. M. Hammond, C. H. Darby.
New Orleans Dental Association — J. R. Walker, A. F. McLain.
Susquehanna Dental Association — T. J. Richards.
Harvard Dental College — T. B. Hitchcock.
Brooklyn Dental Society — W. H. Atkinson, John C. Wyman.
Mississippi Valley Dental Association — James Leslie.

Dr. Taft moved a suspension of the order of business, for the purpose of taking up the proposed amendments to the constitution. Dr. Goddard amended, by making it the special order of business at 3 o'clock. The motion, as amended, prevailed.

The report of the Committee on Physiology was called, and read by the chairman, M. S. Dean.

Adjourned to meet at 2 o'clock P. M.

FIRST DAY — AFTERNOON SESSION.

The Association met pursuant to adjournment; the President in the chair. Minutes of the morning session read and approved.

On motion of Dr. Buckingham, Dr. J. M. Whitney, of Honolulu, was invited to participate in the discussions of the Association.

At the hour of three the special order of business was called up; *i. e.*, the consideration of the proposed amendments to the constitution.

The amendment to Art. III, Sec. 3, was adopted without discussion. As amended it reads as follows:

MEMBERS TO BE OF TWO CLASSES.— The members of this Association shall be of two classes — delegates and permanent members,— having equal rights and privileges, except eligibility to office; none being eligible but those who, upon signing the constitution and paying their dues, shall declare their intention of becoming permanent members.

Amendment to Art. III, Sec. 4, was lost.

Amendment to Art. IX was lost.*

The amendment to Art. VI, Sec. 1, by adding, in its proper place, "a Committee on Etiology," was adopted.

The first amendment to Art. V, Sec. 1, was lost.

The amendment to Art. VI, Sec. 1, was lost.

The second amendment to Art. III, Sec. 3, was lost.

The amendment to Art. V, Sec. 1, by changing the word "two" — the first word on third line from top of page 5 — to "three," and the word "three"— the last word on same line and same page — to "four," was adopted.

Amendment to Art. V, Sec. 6, was adopted.

Dr. Walker offered a motion to rescind the following resolution, adopted in 1872, viz.:

Resolved, That henceforth no person shall be received as a delegate who is in arrears for dues, or until they have paid to the Treasurer the full amount due at the time their names were dropped for non-payment.

The motion prevailed.

* This amendment was subsequently adopted. See page 22.

The Committee on Pathology and Surgery was called, and a report read by the chairman, Dr. H. Judd.

The report was discussed by Dr. Atkinson.

On motion of Dr. Taft, the time of the speaker was extended ten minutes.

The Executive Committee offered the following partial report, which was received, and its suggestions adopted:

The Executive Committee would recommend the following as the hours of meeting and adjournment of these sessions, viz.: Meet at 9 o'clock A. M., and adjourn at 12 M. Meet at 2 P. M., and adjourn at 6 o'clock P. M. The Committee request the Association to decide as to holding clinics; and if there are to be clinics, shall there be evening sessions upon the days of such clinics, from 7:30 to 10 P. M.

J. TAFT,
G. H. CUSHING, } *Committee.*
H. A. SMITH,

On motion of Dr. McDonnell, it was decided to devote Thursday morning to clinical operations.

And, on motion of Dr. Taft, it was decided to hold an evening session on Thursday, from 7:30 to 10 o'clock; and that the election of officers be the special business of the evening.

A motion of Dr. McDonnell, that a "quiz" be held on Wednesday evening, and that it be conducted by the President, was lost.

Adjourned till 9 o'clock to-morrow.

SECOND DAY — MORNING SESSION.

The Association met pursuant to adjournment; President in the chair. Minutes were read and adopted.

Dr. Herriott moved that the Association adjourn to the Put-in-Bay House hall.

Dr. Hitchcock's amendment, that Dr. Chase be instructed to give notice to the members that might be assembled at the Put-in-Bay House, that the Association was now in session at the Beebe House hall, was accepted, put, and adopted.

The Committee to prepare a circular on Popular Education was called; the Chairman not being present, and there being no report, the committee was continued, and the time extended to the next annual session.

The President announced discussion on the subject of Pathology and Surgery in order. The subject was discussed by Dr. Judd, and continued by a paper by Dr. H. S. Chase, a member of that committee, upon the same subject. The consideration of the paper was announced in order, and was discussed by Drs. Judd, Atkinson, Spellman, Carroll, Abbott, Walker, Osmond, Morgan, Herriott, Buckingham, Stellwagen, Douglass, and Chase.

Adjourned to 2 o'clock P. M.

SECOND DAY—AFTERNOON SESSION.

The Association met at the appointed hour; President in the chair. The minutes were read and approved.

The subject of Pathology and Surgery was continued, and discussed by Dr. Stellwagen.

The order of business was suspended, and Dr. Taft, chairman of the Executive Committee, made the following report, which was adopted:

Clinics will be held to-morrow, from 8:30 A. M. to 12 M., in the rooms over Put-in-Bay Saloon, now occupied by Messrs. White & Johnston with dental goods.

Diagnostic Clinics, by W. H. Atkinson.

Operative Clinics, by C. Palmer.

Operative and Diagnostic Clinics, by C. R. Butler.

The subject of Pathology and Surgery was passed, and the report on Histology and Microscopy called for. The Committee not being in the room the subject was postponed, and that of Dental Chemistry called. The Committee not being prepared, further time was granted.

The Committee on Therapeutics was called, and the report read by Dr. H. L. Sage, chairman.

The report was discussed by Drs. Atkinson, Taft, Rehwinkel, and Stellwagen.

Dr. F. H. Rehwinkel offered the following, which was adopted, viz.:

Resolved, That the Committee on Therapeutics be, and hereby is, instructed to investigate the difference of action between carbolic acid, creasote, thymol and carvacrol, and indicate the symptoms or peculiar conditions under which one of these agents is preferable to the others.

The subject of Therapeutics was passed, and the report on Microscopy and Histology read by the chairman of that committee, Dr. T. B. Hitchcock.

Dr. Taft introduced Dr. Eastlak, of China, and on motion he was invited to participate in the discussions of the Association.

The report on Histology was discussed by Drs. Judd, Taft, Hitchcock, Morgan, Atkinson, Rehwinkel, J. S. Smith, and Chase.

Adjourned to 2 o'clock to-morrow.

THIRD DAY — AFTERNOON SESSION.

The Association met pursuant to adjournment.

In the absence of the President and Vice-Presidents, on motion of Dr. Goddard, Dr. Morgan was elected Chairman *pro tem.*

Dr. Walker offered the following resolution:

Resolved, By the American Dental Association, convened at Put-in-Bay, that the recent action of the railroad combination, refusing to make any reduction in fares, as far as it applies to dental, medical or scientific associations, is not only uncalled for but highly reprehensible.

Resolved, That gentlemen who attend such associations, as members or delegates, do so at great personal sacrifice for the benefit of humanity and the general public good, and that their influence tends greatly to advance the interests as well as the area of civilization, and thus to confer such positive benefit upon railroads (which depend upon the increase of civilization for their welfare), that they could well afford to pass such members and delegates both to and from their places of meeting, and that their refusal to grant at least

return passes is laying a tax, which they are illy able to bear, upon men who devote much time and labor, without compensation, for the public good, and is as short-sighted as it is arrogant and selfish.

Dr. Dean proposed to amend by striking out the last clause, which was lost. The main question was then put and the resolution adopted.

A volunteer paper on Histology and Microscopy was read and discussed by Dr. Atkinson.

On motion of Dr. H. A. Smith, Dr. Eastlak was invited to give a history of his experience and practice in China; whereupon Dr. E. gave a very interesting account of his professional life and the status of dentistry in China.

Dr. Rehwinkel offered the following resolutions, which were adopted:

In view of the fact that an urgent necessity does exist to supply the army and navy of the United States with competent dental surgeons, it is hereby

Resolved, That a committee of three be appointed to solicit and secure, first, the co-operation of the Surgeon General of the United States army, and, if needful, to memorialize Congress to make provisions for the appointment of dental surgeons to both the army and navy.

The following committee was subsequently appointed by President Buckingham: F. H. Rehwinkel, Geo. H. Cushing, J. H. McQuillen.

Resolved, That this Association, recognizing and appreciating the liberality of the Cincinnati, Hamilton & Dayton and Michigan railroads, and also the Cincinnati, Columbus, Cleveland and Indianapolis railroads, and the Short Line railroad from Louisville to Cincinnati (and other railroads conferring similar favors), in granting round-trip tickets to and from Put-in-Bay to members and delegates of the American Dental Association, hereby express its sense of obligations to the officers of the above named roads.

REPORT OF AUDITING COMMITTEE,

which, on motion of Dr. Stellwagen, was accepted and adopted:

Your Committee, having examined the Treasurer's account, with vouchers attached, find it to be correct:

Amount on hand at last report	$358.63
Amount received since last report	921.50
Total	$1,280.13
Amount of expenditures since last report	960.00
Balance on hand	$320.13

J. TAFT,
GEO. H. CUSHING.

The report on Dental Chemistry was called for, and a paper was read by Dr. Webb, a member of that committee. The subject was discussed by Drs. Atkinson, Buckingham, Summers, Taft, Osmond, Douglass, McLain, Knapp, Hitchcock, Hunter, Stellwagen, Palmer, Whitney, Corbin, Forbes, and others, and the subject passed.

The report of the Committee on Operative Dentistry was called. No member of that committee being present, and no report having been prepared, the subject was discussed by Dr. Hitchcock.

Adjourned.

THIRD DAY—EVENING SESSION.

Association met pursuant to adjournment; W. H. Morgan in the chair. The minutes of the previous session were read and adopted.

Dr. Taft moved that the Association proceed to the selection of the next place of meeting. Upon vote, Detroit was elected.

The result of the election for officers for the ensuing year was as follows:

President—T. L. BUCKINGHAM, Philadelphia.
First Vice-President—ISAIAH FORBES, St. Louis.
Second Vice-President—A. F. MCLAIN, New Orleans.
Corresponding Secretary—J. TAFT, Cincinnati.
Recording Secretary—M. S. DEAN, Chicago.
Treasurer—W. H. GODDARD, Louisville.
Executive Committee—GEO. L. FIELD, Detroit; G. R. THOMAS, Detroit; G. H. CUSHING, Chicago.

The President appointed G. H. Cushing and H. A. Smith Committee on Publication.

On motion of Dr. Cushing, the Treasurer was directed to pay the usual warrants drawn on him for the salaries of the Reporter, Secretary, and Treasurer.

Adjourned.

FOURTH DAY—MORNING SESSION.

Association convened pursuant to adjournment; Dr. Morgan in the chair. The minutes of the previous meeting were read and approved.

Discussion on Operative Dentistry was declared in order, and participated in by Drs. Judd, Hitchcock, Stellwagen, Herriott, Carroll, McDonneld, Taft, Knapp, Morgan, Chupein, and Smith.

On motion of Dr. Goddard, the question under discussion was passed, and the newly-elected President installed in office.

Drs. Sage and Cushing were appointed to conduct the President elect to the chair.

T. L. Buckingham being duly installed in office, the Committee on Mechanical Dentistry was called, and reports read by Drs. Herriott and Eames, and discussed by Drs. Honsinger and Herriott.

On motion of Dr. Stellwagen, the subject of Mechanical Dentistry was passed.

A gold medal having been sent to the President by the California State Dental Association, with the request that it be presented to Dr. S. C. Barnum by this Association, in behalf of that body, the President appointed Dr. C. C. Knowles, of San Francisco, to make the presentation, which he did in a most appropriate speech, which was feelingly responded to by the recipient.

The report of the Committee on Dental Education was called for, and read by the chairman, Dr. W. H. Morgan, and followed

by Dr. E. J. Waye, a member of that committee. Discussed by Drs. Morgan and Herriott.

On motion, Dr. C. Palmer was granted twenty minutes' time to explain a case of operating instruments.

Adjourned to 2 o'clock P. M.

FOURTH DAY—AFTERNOON SESSION.

The Association convened pursuant to adjournment; the President, T. L. Buckingham, in the chair. The reading of the minutes of the preceding session was suspended.

Dr. Judd offered the following:

Resolved, That the President appoint a committee of seven to take such measures as they may see fit to protect the interests of dentists and continue the work commenced by the committee of last year.

The resolution was adopted and the committee appointed as follows: H. Judd, St. Louis; E. Honsinger, Chicago; Louis Jack, Philadelphia; S. H. Noble, Washington; S. W. Dennis, San Francisco; H. A. Smith, Cincinnati.

Dr. Cushing, chairman of the Committee on Dental Literature, read reports prepared by himself and Dr. Bogue. The subject was discussed by Drs. Morgan, Atkinson, Hitchcock, Thomas, Wright (Pomaria), Stellwagen, Taft, Herriott, and Judd. On motion, the subject was passed.

Etiology was called. A paper was presented on that subject by Seneca B. Brown, a member of that committee, and read by the Secretary. Discussed by Dr. Judd and passed.

Verbal reports from the Committee on Local Societies were made by Drs. Judd, Taft, and Atkinson. The reports were received and the committee continued.

The Executive Committee reported names for standing committees, which was referred back, amended and adopted as follows:

STANDING COMMITTEES.

Physiology — M. S. Dean, E. A. Bogue, A. W. Harlan.
Pathology and Surgery — H. Judd, H. S. Chase, C. C. Knowles.
Histology and Microscopy — T. B. Hitchcock, C. E. Latimer, J. Taft.
Chemistry — H. A. Smith, C. R. Butler, W. T. Wallace.
Therapeutics — T. C. Stellwagen, L. Jack, J. McManus.
Operative Dentistry — L. D. Shepard, G. C. Daboll, G. L. Field.
Mechanical Dentistry — S. B. Brown, J. F. Canine, E. D. Swain.
Dental Education — A. F. McLain, G. W. Keely, E. J. Waye.
Dental Literature — W. H. Eames, Chas. Buffet, P. G. C. Hunt.
Dental Etiology — J. H. McQuillen, M. H. Webb, Jas. Johnstone.
Prize Essays — W. H. Goddard, Isaiah Forbes, G. F. S. Wright.

DR. WM. H. GODDARD, TREASURER, IN ACCOUNT WITH AMERICAN DENTAL ASSOCIATION.

Dr. August, 1872.			
To Balance, 1871			$358 63
Cash, dues, 1869	$ 5 00		
" " 1870	55 00		
" " 1871	160 00		
" " 1872	700 00		
" sale Transactions	1 50		
		921 50	
			$1,280 13
Cr. August, 1872.			
By paid Voucher No. 1	$100 00		
" " No. 2	73 00		
" " No. 3	5 75		
" " No. 4	4 60		
" " No. 5	50 00		
" " No. 6	50 00		
" " No. 7	650 00		
" " No. 8	10 75		
" " No. 9	1 20		
" " No. 10	14 70		
		960 00	
August 5th, 1873. Balance, cash in my hands		320 13	
			$1,280 13

WM. H. GODDARD, *Treasurer.*

We have examined the Treasurer's Report, and find the same correct.

GEO. H. CUSHING, } *Committee.*
J. TAFT, }

PUT-IN-BAY, *August 7th, 1873.*

On motion of Dr. Cushing —

Resolved, That the necessary orders be drawn on the Treasurer for the payment of all current expenses, and that the Treasurer be instructed to pay the draft of the Secretary, countersigned by the President, to meet the expenses of the Publication Committee, when they shall be required.

Dr. Goddard offered the following, which was adopted:

WHEREAS, The printed copies of the constitution of this body are exhausted; therefore

Resolved, That the Publication Committee be, and hereby is, authorized to publish five hundred copies of the same, adding such amendments as have been made since 1869; and that the constitution be published with the coming Transactions.

[The latter clause was an amendment offered by Dr. Wright.]

Dr. Goddard moved a reconsideration of the vote whereby the amendment to Article IX, proposed at the last annual meeting, was rejected. Carried. The main question was then put and the proposed amendment adopted.

Dr. H. A. Smith presented the following resolution, which was unanimously adopted:

Resolved, That the thanks of this Association be, and hereby are, tendered to the proprietors of the Beebe House for the gratuitous use of this hall for the holding of its meetings; and also for the many kind attentions received from them during the present session.

Dr. Goddard proposed the following amendment to the constitution:

To amend Art. III, Sec. 3, thus:

SEC. 3. *Members to be of three classes.* The members of this Association shall be of three classes, viz.: Delegates, Permanent, and Honorary members; the two former classes having equal rights and privileges, except eligibility to office — none being eligible to hold office except permanent members; the latter class to consist of prominent worthy members of the dental profession residing in foreign countries, who shall be elected by ballot.

Dr. Keely offered the following:

Resolved, That a committee of three be appointed to carry into effect the resolution passed unanimously at Nashville, Tenn., viz.: to raise $1,000 to

present to Dr. S. C. Barnum, as a slight appreciation of his invaluable gift to the profession.

The resolution was adopted, and the following committee appointed by the Chair: Geo. W. Keely, Ohio; G. F. S. Wright, South Carolina; J. N. Crouse, Illinois.

Dr. Stellwagen moved to reconsider the vote whereby the amendment to Article IX was adopted. The motion was lost.

Adjourned to meet in Detroit on the first Tuesday in August, 1874, at 10 A. M.

AMENDED CONSTITUTION,

ADOPTED AT SARATOGA, AUGUST, 1869,

WITH AMENDMENTS UP TO AND INCLUDING THE SESSION OF 1873.*

ARTICLE I.

NAME.—This organization shall be known by the name of the AMERICAN DENTAL ASSOCIATION.

ARTICLE II.

OBJECTS.—The objects of this Association shall be, to cultivate the science and art of Dentistry, and all its collateral branches; to elevate and sustain the professional character of Dentists, to promote among them mutual improvement, social intercourse and good feeling, and collectively to represent and have cognizance of the common interests of the Dental Profession.

ARTICLE III.

SECTION 1. MEMBERSHIP. NUMBER OF DELEGATES FROM LOCAL SOCIETIES.—Each local society may send one for every five of its active members, and each Dental College one from its faculty, as delegates to this Association, for one year. upon complying with the requirements of its Constitution; but no society shall be entitled to representation that does not adopt or substantially recognize its code of ethics.

SEC. 2. EXPELLED MEMBERS.—Any member of this Associa-

---

* All amendments to Amended Constitution are printed in italics.

tion, being expelled from his local society, shall from that date cease to be a member of this body.

SEC. 3. MEMBERS TO BE OF TWO CLASSES.—*The members of this Association shall be of two classes, delegates and permanent members, having equal rights and privileges, except eligibility to office, none being eligible but those who, upon signing the constitution and paying their dues, shall declare their intention of becoming permanent members.*

[The following amendment was proposed at the session of 1873, which, if adopted at the session of 1874, will take the place of the above section.

SEC. 3. MEMBERS TO BE OF THREE CLASSES.—The members of this Association shall be of three classes, viz.: Delegates, permanent, and honorary members; the two former classes having equal rights and privileges, except eligibility to office — none being eligible to hold office except permanent members; the latter class to consist of prominent worthy members of the dental profession residing in foreign countries, who shall be elected by ballot.]

SEC. 4. DELEGATES.—All delegates shall be practitioners of Dentistry: they shall receive their appointment only from permanently organized Dental Societies and Dental Colleges, having definite conditions of membership other than pecuniary, which shall have been approved by the Executive Committee, and a copy of which shall be in the hands of the Recording Secretary of this body.

SEC. 5. PERMANENT MEMBERS.— Permanent members shall consist of those who, having served one year as delegates, and complied with the requirements of the Association, shall signify to the Treasurer a desire for permanent membership.

SEC. 6. SIGNING CONSTITUTION.— Each new member before voting or speaking on any subject before the meeting, shall sign these regulations, inscribing his name, and the title and location of the institution from which he receives his appointment.

SEC. 7. DUES.— Five dollars shall be paid to the Treasurer by each member yearly, as dues, before he can be eligible to office, or speak or vote on any subject before the Association; and in case the dues remain unpaid at the close of the second annual meeting thereafter, the name of any such delinquent shall be erased from the list of members without further action.

SEC. 8. GIVING NAME ON RISING.— No one shall be permitted to address the Association before giving his name and residence, which shall be distinctly announced from the chair; nor

shall he speak more than twice, nor longer than fifteen minutes in all, unless by consent of the Association.

SEC. 9. CONDUCT OF MEMBERS.—Any act of special immorality or unprofessional conduct, committed by a member of this Association, shall be referred to the Executive Committee (second division), whose duty it shall be to thoroughly examine into the case, and report at the next meeting, if the charges be sustained. Whereupon, by a vote, the offending member may be reprimanded or expelled, a two-thirds vote being required for expulsion, a majority being sufficient for reprimand.

ARTICLE IV.

TIME OF MEETINGS.—The regular meetings of the Association shall be held annually, and commence on the first Tuesday in August. The place of meeting shall be determined each year by vote of the Association.

ARTICLE V.

SECTION 1. OFFICERS: HOW ELECTED.—The officers of this Association shall be a President, two Vice-Presidents, Corresponding Secretary, Recording Secretary, Treasurer, and the Executive Committee, who shall be elected by ballot without nomination. The *three* names, or in case of a tie, the *four* names, having the greatest number of votes, shall be the sole nominees in case of failure to elect on the first ballot, and a majority of all the votes cast for those names, shall be necessary to a choice.

Each officer, except as otherwise provided, shall hold his appointment for one year, or until another is elected to succeed him.

SEC. 2. PRESIDENT, DUTIES OF.—The President shall preside according to parliamentary usage, as laid down in Cushing's Manual, and the rules of order adopted by this Association.

SEC. 3. VICE-PRESIDENT.—In the absence of the President, one of the Vice-Presidents shall perform the duties of the office; and in the absence of these officers, a chairman *pro tem.* shall be appointed by acclamation.

SEC. 4. CORRESPONDING SECRETARY.—The Corresponding Secretary shall attend to the correspondence of the Association

with the societies therein represented, and to correspondence with other scientific bodies as may be desirable.

SEC. 5. RECORDING SECRETARY.—The Recording Secretary shall keep accurate minutes of the proceedings of the Association, preserve the archives and unpublished documents, and attend to the other duties that pertain to his office. He shall be *ex officio* chairman of the Publication Committee, and shall see that due notice is given of the time and place of meeting of the Association.

SEC. 6. EXECUTIVE COMMITTEE.—The Executive Committee shall be the business committee of the Association, and shall consist of nine members, to whom shall be referred all business not otherwise specially provided for. They shall report at each meeting, under the proper head, their doings for the current year.

SUB-COMMITTEES. FIRST DIVISION: COMMITTEE OF ARRANGEMENTS.—Three members of this committee shall act as the Committee of Arrangements, and shall procure suitable accommodations for the meetings and clinics, and for the exhibition and examination of appliances, of which they shall have the charge. *They shall also report to the Association upon any and all appliances which may be placed in their hands.* These three shall, if practicable, reside at or near the place at which the Association is to hold its next annual meeting, and shall attend generally to the wants of the Association during its session.

SECOND DIVISION: CREDENTIALS AND AUDITING COMMITTEE. Other three shall examine and verify the credentials and qualifications of members, including all violations of the code of ethics and the constitution, and shall also be the auditing committee for that year.

THIRD DIVISION: COMMITTEE ON NOMINATIONS AND VOLUNTEER ESSAYS.—The remaining three shall examine all volunteer essays, and before they are read to the Association shall give their approval, in order that time may not be taken up by unworthy or irrelevant matter.

They shall report names for the Standing Committees for the ensuing year, and the names of places for the next meeting.

PUBLICATION COMMITTEE: HOW APPOINTED.—Immediately after the election of new members to the Executive Committee, two from that committee shall be appointed by the President to

act in conjunction with the Recording Secretary, as the Publication Committee. They shall be authorized to employ a competent reporter to furnish an accurate report of the proceedings of each meeting.

Instructions to the Publication Committee.—They shall superintend the publication and distribution of such portions of the Transactions as the Association may direct, or the committee judge to be of sufficient value. They shall specify in the annual report of this committee the character and cost of the publications of the Association during the year, and the number of copies still on hand.

Disclaimer.—This committee is hereby instructed to print, at the beginning of each volume of the Transactions, the following disclaimer, viz.: "The American Dental Association, although formally accepting and publishing the reports of the various Standing Committees, and the essays read before the Association, holds itself wholly irresponsible for the opinions, theories, or criticisms therein contained, except when otherwise decided by special resolution."

Reports of Sub-Committees.—Each of these sub-committees shall report from time to time, as may be necessary, to the Executive Committee as a whole, who shall decide upon such report if possible; but in case of their inability to decide upon any matter, it shall be brought before the Association for its decision as early as practicable.

Classification of Executive Committee.—At the first election of this committee, the first three shall be elected to serve three years, the second three for two years, and the last three for one year, and thenceforward three new members shall be elected each year by ballot, to serve three years, and in case of the absence of any member of this committee his place may be temporarily filled by the remaining members of the committee.

Meetings of Executive Committee.—The Executive Committee shall, if possible, meet for consultation and arrangement of their respective duties, on the day preceding the annual meeting of the Association, and shall meet for the examination of credentials, the arrangement of appliances, and the reception of papers, and such other business as may properly come before them, at 8 A. M., on the day of the annual meeting.

Subdivision of Executive Committee.—They shall also meet, after the election of new members to the committee, to choose their own chairman and secretary, and to divide themselves into sub-committees, as hereinbefore provided, and for the purposes described.

Chairman may Convene the Committee.—The chairman of this committee may, at his own discretion, summon the members thereof to a meeting, at any suitable hour during the sessions of the Association.

Sec. 7. Treasurer to attend, to receive dues, at 8 a. m. —The Treasurer shall hold all the moneys belonging to the Association, and shall keep an accurate account as between the society and its members. He shall attend the meeting of the Executive Committee at 8 a. m., on the day of the annual meeting, to receive dues, and shall attend at roll-call to verify the list of names, checking all such as are in arrears for dues; he shall restore such names upon payment of dues within the legal limits, and shall notify all whose names may be erased from the list of membership. He shall pay the drafts of the President, countersigned by the Secretary, upon vote of the Society only, and shall report to the Executive Committee where his accounts shall be audited, and by whom his report shall be presented to the Association, together with their own.

ARTICLE VI.

Section 1. Names of Standing Committees.—The following Standing Committees of three shall be appointed at each annual meeting, to prepare, arrange, and expedite business in their several departments for the ensuing year, viz.:

A Committee on Physiology.
" Dental Pathology and Surgery.
" Dental Histology and Microscopy.
" Dental Chemistry.
" Dental Therapeutics.
" Operative Dentistry.
" Mechanical Dentistry.
" Dental Education.
" Dental Literature.
" *Etiology*.
" Prize Essays.

SEC. 2. DUTIES OF MEMBERS OF COMMITTEES.—It shall be the duty of each member of the Standing Committees to make an individual report, so far as such report can be made, and, in case of inability to be present at the meeting where that report is due, to forward it to the Recording Secretary, from whom it can be obtained by the chairman of each committee, respectively, at the time of assembling of this Association.

SEC. 3. DUTIES OF COMMITTEES.—Each committee shall report, if practicable, the results of original investigations in their several departments, and also such new matter, collected from all the sources at their command, as may be of interest and profit to the Association.

SEC. 4. COMMITTEES ON OPERATIVE AND MECHANICAL DENTISTRY.—The Committees on Operative and Mechanical Dentistry shall thoroughly test and report upon new modes and materials, and upon their physical properties, stating clearly why any particular mode of practice should claim attention, and giving tabulated lists of successes and failures so far as may be obtainable.

SEC. 5. PRIZE ESSAYS.—Two prizes of medals, not exceeding in value fifty dollars each, may be awarded to the best two communications reported on favorably by the Committee on Prize Essays, directed by the Association to be published.

ARTICLE VII.

QUORUM. — Fifteen members shall constitute a quorum for the transaction of business in this Association.

ARTICLE VIII.

SUSPENDING RULES: THREE-FOURTHS TO VOTE.—This order of business may be temporarily suspended by a three-fourths vote of all the members present, for the consideration of a specific subject, upon the completion of which the regular order shall be at once resumed.

ORDER OF BUSINESS.

1. Meeting of the Executive Committee, filling of vacancies therein, examination of credentials, and payment of dues, 8 A. M.
2. Organization of the meeting, 10 A. M.
3. Calling the roll of qualified members.

4. Reading of the minutes, and action thereon.

5. The reading and consideration of the stated annual reports from the Standing Committees, together with volunteer papers upon the same subjects, in their consecutive order.

6. Report of Executive Committee.

7. Balloting for the place of next annual meeting.

8. Election of officers and three members of the Executive Committee.

9. Appointment of Standing Committees.

10. Instructions to the Permanent Committees.

11. Unfinished, new, and miscellaneous business.

12. Adjournment.

ARTICLE IX.

AMENDMENTS.—"*Alterations and amendments may be made in the foregoing Articles or Rules of Order, at any annual meeting, by the consent of all the members present. Otherwise, notification in writing shall be made of any such proposed alterations or amendments, and laid over for one year for final action, when they can only be adopted by an affirmative vote of two-thirds of the members present.*"

RULES OF ORDER.

1. On the arrival of the hour of meeting, the President shall take the chair, call to order, and announce that the meeting is open for business.

2. No motion or speech shall be in order until the mover or speaker shall have been recognized and assigned the floor by the chair, nor shall a motion be open for debate until seconded and stated by the chair.

3. At the request of any member a motion shall be put in writing.

4. At the request of five members a question shall be divided, or the yeas and nays ordered.

5. When a question is under debate, no other motion shall be in order, except—1st, to adjourn; 2d, to lay on the table; 3d, the previous question; 4th, to postpone; 5th, to commit; 6th, to amend — and these motions shall take precedence in the order here stated.

6. The previous question, and the motions to adjourn, to lay on the table, and to postpone, shall be decided without debate.

7. A motion to adjourn shall be always in order, but no member can make such a motion while another is speaking, or while a vote or ballot is being taken.

8. A second amendment to the main question shall not be in order until the first is disposed of, nor shall there be an amendment of an amendment to an amendment.

9. After a motion has been seconded and stated by the chair, it shall not be withdrawn without the consent of the Society.

10. No member shall interrupt another while speaking, except to call him to order.

11. When called to order, a member shall sit down until the point of order is decided by the chair, or, in case of appeal, by the Society. If the point of order be sustained, the member can proceed in order by the consent of the Society.

12. Every member shall vote upon a question unless excused by the Society.

13. When any motion, except to adjourn, has been rejected, it shall not be renewed without unanimous consent.

14. Any member who voted in the majority may move a reconsideration of that question, but if that motion shall be lost or laid upon the table, it shall not be renewed without unanimous consent.

15. The President may vote with the members upon all questions, but having so voted, shall not give the casting vote in case of a tie.

16. Motions for filling blanks shall be put in the order in which they are moved.

17. On a division, or in voting by yeas and nays, any member may change his vote before the result is declared.

18. These rules may be suspended by unanimous consent.

Code of Dental Ethics.

ARTICLE I.

THE DUTIES OF THE PROFESSION TO THEIR PATIENTS.

Section 1. The dentist should be ever ready to respond to the wants of his patrons, and should fully recognize the obligations involved in the discharge of his duties toward them. As they are, in most cases, unable to correctly estimate the character of his operations, his own sense of right must guarantee faithfulness in their performance. His manner should be firm, yet kind and sympathizing, so as to gain the respect and confidence of his patients; and even the simplest case committed to his care should receive that attention which is due to any operation performed on living, sensitive tissue.

Sec. 2. It is not to be expected that the patient will possess a very extended or a very accurate knowledge of professional matters. The dentist should make due allowance for this, patiently explaining many things which may seem quite clear to himself, thus endeavoring to educate the public mind so that it will properly appreciate the beneficent efforts of our profession. He should encourage no false hopes by promising success where, in the nature of the case, there is uncertainty.

Sec. 3. The dentist should be temperate in all things, keeping both mind and body in the best possible health, that his patients may have the benefit of that clearness of judgment and skill which is their right.

ARTICLE II.

MAINTAINING PROFESSIONAL CHARACTER.

Section 1. A member of the dental profession is bound to maintain its honor, and to labor earnestly to extend its sphere of usefulness. He should avoid everything in language and conduct

calculated to discredit or dishonor his profession, and should ever manifest a due respect for his brethren. The young should show special respect to their seniors; the aged special encouragement to their juniors.

SEC. 2. The person and office arrangements of the dentist should indicate that he is a gentleman; and he should sustain a high-toned moral character.

SEC. 3. It is unprofessional to resort to public advertisements, cards, handbills, posters or signs calling attention to peculiar styles of work, lowness of prices, special modes of operating, or to claim superiority over neighboring practitioners; to publish reports of cases, or certificates in the public prints; to go from house to house to solicit or perform operations; to circulate or recommend nostrums, or to perform any other similar acts.

SEC. 4 When consulted by the patient of another practitioner the dentist should guard against inquiries or hints disparaging to the family dentist, or calculated to weaken the patient's confidence in him; and if the interests of the patient will not be endangered thereby, the case should be temporarily treated, and referred back to the family dentist.

SEC. 5. When general rules shall have been adopted by members of the profession practising in the same localities, in relation to fees, it is unprofessional and dishonorable to depart from these rules, except when variation of circumstances requires it. And it is ever to be regarded as unprofessional to warrant operations or work as an inducement to patronage.

ARTICLE III.

THE RELATIVE DUTIES OF DENTISTS AND PHYSICIANS.

Dental surgery is a specialty in medical science. Physicians and dentists should both bear this in mind. The dentist is professionally limited to diseases of the dental organs and the mouth. With these he should be more familiar than the general practitioner is expected to be; and while he recognizes the superiority of the physician, in regard to diseases of the general system, the latter is under equal obligations to respect his higher attainments in his specialty. Where this principle governs, there can be no conflict, or even diversity, of professional interests.

ARTICLE IV.

THE MUTUAL DUTIES OF THE PROFESSION AND THE PUBLIC.

Dentists are frequent witnesses, and at the same time the best judges, of the impositions perpetrated by quacks, and it is their duty to enlighten and warn the public in regard to them. For this and the many other benefits conferred by the competent and honorable dentists, the profession is entitled to the confidence and respect of the public, who should always discriminate in favor of the true man of science and integrity, and against the empiric and impostor. The public has no right to tax the time and talents of the profession in examinations, prescriptions, or in any way, without proper remuneration.

REPORTS

OF

STANDING COMMITTEES,

VOLUNTEER ESSAYS,

AND

DISCUSSIONS.

REPORT OF THE COMMITTEE

ON

DENTAL PHYSIOLOGY.

By M. S. DEAN, Chairman.

THE physiology of the teeth and adjacent parts has received considerable attention by the members of our profession during the past year. And while I shall not attempt to present all the theories and facts that have been promulgated, not to say *originated*, I will place before you such new doctrines advanced as have come directly within my notice.

But before attempting this, I must apologize to this Association for the lack of preparation which must appear evident in this report; for, owing to causes which I could not control, this work had been delayed until it was too late for me to prepare anything like an elaborate or complete report upon this subject. Your indulgence is, therefore, asked for the omissions of matter it should contain, and for the faults in the matter it does contain.

Among the new theories that have come prominently to our notice is that advanced by C. S. Tomes, on "The Developmental Origin of the V-Shaped Maxilla," published in the June and July numbers of "The Monthly Review." In this paper he gives some new and interesting physiological facts in regard to the normal and abnormal development of the jaws; referring the V-shaped malformation back to the period of intra-uterine life. He shows that this peculiar deformity in the adult is nothing more than the necessary sequence of a malformation which occurred before birth, though at that time it would not be sufficiently marked to attract attention. This malformation in the adult jaw, he claims, is the

result of malformation in the fœtal jaw, which does not present, posteriorly, the slight divergence which exists in the case of normal jaws. The adult jaw retaining the same *form* that it did in its fœtal existence (with a slight increase in size), there will be, in this fœtal malformation alluded to, an angle at the point where the elongation posteriorly commences; that is, in the region of the second bicuspids, which accounts for this V-shaped deformity. As it is impossible for me to give you a clear idea of the author's views upon this subject, with this brief reference to it, I will refer you to the article itself, which you will find able and instructive.

In an Essay read by Dr. H. S. Chase, at the joint sessions of the Illinois and Iowa State Dental Societies, on the subject entitled "The part which vital action plays in the history of dental caries," a new physiological idea was broached — at least new to me — of which I will endeavor briefly to report. The point incidentally raised in that paper, to which I wish to call your attention, is so intimately involved with pathological questions as to render them inseparable. I will, therefore, give a brief synopsis of that portion of the paper relating to this point, in order that its physiological bearing may be more clearly apprehended.

The author claims: That the pressure — lateral pressure — of one tooth against another may produce *necrosis* of the enamel, thus causing the circulation of the blood-plasma to cease in its basal structure, and discoloration to take place in this tissue in consequence of this necrosis;

That the irritation or inflammation consequent upon, or simultaneous with, this necrotic process, causes a vital movement in the dentine which carries away the lime salts through the sound structure of the dentine to the blood-vessels of the pulp;

That when the dentine is reached, by a cutting instrument, under or immediately beneath this necrosed enamel, it is found to be softened and somewhat decalcified, but not discolored;

That in cutting a little further into this dentine, it is found still softer than that portion adjacent to the enamel, owing apparently to a greater decalcification of the tissue; and afterward the normally hard dentine is reached.

"In all this," he says, "there is evidently no loss of *basal* structure, either in the enamel or the dentine, but there is a loss of substance; and this is in the lime salts of the dentine." "It is

apparent," he continues, "that there has been no *external* loss of tooth substance. There has been no *chemical* process taking place, but there has been a vital movement in the *interior* of the tooth; in fact, among the tubuli themselves, resulting in the process called absorption. The calcareous elements have been carried away through the interior vessels of the tooth, and not by a chemical wasting away from the exterior."

In support of this theory, the author instances, among others, the following facts, which I will give substantially, though not seriately:

1. That absorption takes place in rare instances in the sound dentine under a perfect plug, to the extent even of exposing the pulp.

2. That the dentinal structure of the permanent teeth of adults may become less dense than they were at a former period, owing to interstitial decalcification having taken place.

3. That the two opposite processes — viz., calcification and decalcification — may and do take place in the hard tissues of the teeth.

4. That, in the teeth themselves, exostosis is sometimes caused by the irritation of a dead and decomposing pulp; and at other times absorption of the cementum and dentine of the roots takes place from the same cause.

The above are the main grounds upon which this theory is based, although I have not presented them as fully, nor perhaps as clearly, as the author would have done.

The same author, in the May number of the "Missouri Dental Journal," advances some views in regard to the absorption of the deciduous teeth that are, to say the least, both novel and ingenious.

In this article he affirms that the "absorption of dental tissue in deciduous teeth is a *retrograde* physiological process." "It is a work," he says, "done neither by the dental blood-vessels, the gum, a 'carneous body,' or by any other tissue or organ; but it is the work performed by the *tooth itself!*"

"The bone corpuscles of the cementum," he affirms, "change their shape and become connective-tissue cells." "The dentine tubes, also, are gradually changed into the same kind of cells as those of which they are composed before dentine tubes were formed, namely, connective-tissue cells."

"The same change takes place in the pulp cavity, the metamorphosis commencing next to the pulp; and the latter grows in size by a transformation of dentine tubes into connective-tissue cells of which the pulp is composed, and from which the dentine tubes were originally differentiated. At the bottom and sides of the alveolus the cells of connective tissue are gradually changed to bone-corpuscles, and then the inter-cellular space is filled with calcareous matter and true bone is formed."

The views advanced by this author, in regard to the absorption of deciduous teeth, lack sustaining evidence. Nevertheless, as before stated, they are novel and ingenious, and worthy of your careful consideration; for although histologists and physiologists are generally agreed in the fact that the absorption of these teeth is accomplished by forces *external* to the tooth, differing only in their theories as to the *mode* of operation; yet on this latter point, at least, they possess no certain knowledge, and their theories are of no greater value than those of the author above quoted.

A theory has been advanced — or rather, a statement has been made — by Dr. Garretson, in regard to the development of the enamel, in his second edition of "A System of Oral Surgery," which is new, at least to the writer, and is, I think, deserving of notice. He says, on pages 105–6: "The formation of dentine completed, the covering of it with enamel begins; or rather, this deposit is, to a degree, coincident with the dentinal formation. Secreted by the *same pulp* which formed the dentine, the same secretion, some portion finds its way into and through the primary sac. As it passes through this sac it is modified, receives new elements, perhaps, which, as it is received into the second space, or the space between the first and second caps, impresses upon it the arrangement of its particles after the hexagonal order of the enamel. Between the enamel thus formed and the dentine, exists the primary sac; simply the originally modified mucus membrane, which we first saw as overlying the papilla. This membrane continues its existence between these two hard bodies, and receives and modifies, for the support of the enamel, the liquor sanguinis exuded from the dentinal tubules and inter-tubular structures. It may be called the enamel membrane. It has of course been much modified; it is from it that we receive the impressions of pain when becoming exposed by a break in the continuity of enamel," etc. etc.

These are the peculiar views of Dr. Garretson in regard to the development of the enamel, pretty fully quoted. He does not, however, give us any demonstrative evidence — in fact he gives us no evidence — in support of this new doctrine. But that it is not purely speculative, we are led to infer in a succeeding paragraph, in which he says: "The observations leading to the conclusions have been somewhat extensive, and the phenomena seem certainly indorsed by general physiological analogy."

This theory in many respects is a plausible one, and your Committee regret that "the observations leading the author to these conclusions" were omitted in this work. Although at the first reading this theory appeared absurd to the writer of this report, yet on second thought he finds some reasonable grounds for the support of this view. If the observations of Tomes are reliable — — and I believe histologists pretty generally agree with him on this point — the dentinal fibers often extend into the substance of the enamel. This fact, as far as it has any significance in relation to the development of the enamel, would, to my mind, favor the theory of Dr. Garretson. Again: It is admitted, generally, that the enamel, *after* the tooth has been erupted, becomes more fully developed, receives an additional supply of calcareous salts, and also that the enamel, after it has become fully developed, is the recipient of nutrient matter. Now, from whence is this developing material and this nutrient matter derived? Most assuredly from the dental pulp. If this power resides in the dental pulp *after* the enamel organ has disappeared, it would seem *possible* that it may possess the formative power ascribed to it by Dr. Garretson.

But there seem to be physical difficulties in the way that render this theory highly improbable. It is a well established histological fact that the enamel and dentine are developed in opposite directions, the dentine being formed by the deposition of new layers from without inward, while the enamel is formed in a similar manner from within outward.

According to Dr. Garretson's view, the formative material, after the process of development has *commenced*, would have to be conveyed not only through the formed portion of the dentine but also through the formed enamel.

But my object is not to refute or confirm any physiological doctrine that may be presented in this report, but to throw out

such suggestions as may occur to me at the moment of writing. I regret that the author, who asserts that he considers his theory "*irrefutable*," did not think it worth while to present his readers with some of the many observations that led him to his conclusions.

I will now call your attention to a paper presented by myself at a recent meeting of the Illinois and Iowa State Dental Societies upon the subject — "May the calcific elements of the deciduous teeth be appropriated in the formation of any portion of the permanent ones?" — which, slightly abridged, is as follows:

If we take a comprehensive survey of the general features of this subject, simply in the light of common sense, we shall be struck with amazement at the *economy* which manifests itself everywhere in the construction and maintenance of each individual part of the human body. In the formation of the osseous system, for instance, we shall see lightness combined with inflexibility and strength; and wherever it becomes necessary to use the bones for fulcrums or as attachments for the muscles, their bulk is increased, while their weight and strength still retain their just proportion to the other parts. In short, they are composed of materials so arranged that the least possible quantity of matter will yield the greatest amount of durability and strength.

Then, again, we shall observe that the *supply* of materials that is furnished for the growth and repair of the organs is used with scrupulous economy. No portion is lost or allowed to go to waste. To guard against this waste of material, the system is traversed by a host of little gleaners — the lymphatics — which gather up from the interstitial parts all the strayed exudations, and carry them into the general circulation; so that nothing which can be assimilated or appropriated by any organ or tissue is permitted to go to waste, or escape from the system as excreted substance, unless there be an excess of these ingredients in the system.

Now, as a familiar example illustrative of the *economy* with which the system may use the *inorganic* materials introduced in the food, the management and disposition of common salt affords an excellent one. And upon this point I cannot do better than quote the words of Draper, who, I believe, expresses the opinion of physiologists generally upon this subject. He says: "Oxide of sodium, or soda, is a uniform ingredient of the bile.

The hydrochloric acid of the gastric juice, and the soda of the bile, are derived from the same source — common salt — which is either present in the food or purposely added as a condiment. * * * Considering the large quantity of these secretions produced in a short space of time, it is clear that the drain of common salt must be great — not less than a third of an ounce a day; yet the quantities consumed, at least, are only small. How, then, is this explained? Assuredly, there is no other source from which these bodies can come than the one indicated — the common salt — and yet it seems to be totally inadequate." He says further: "I think this difficulty is rather imaginary than real. Things are so arranged that a limited quantity of salt can produce unlimited quantities of gastric juice and bile; for the former, associated with the food it has digested, scarcely escapes from the pyloric valve before it encounters the bile and pancreatic juices discharging into the duodenum, and through the length of the upper portion of the small intestines these secretions, together with the food they have acted upon, are brought into complete contact. The reproduction of chloride of sodium is, therefore, constantly taking place in intestinal digestion, and it returns back into the system through the absorbents. Again, it undergoes decomposition, its acid reappearing in the gastric juice, and its alkali in the pancreatic juice and bile. By thus using a small amount over and over again, great effects can be produced, and it is then only necessary to restore those small portions that are wasted in carrying out the general scheme."

Here Draper has given a beautiful illustration of the wonderful economy with which the system may use the *inorganic materials*.

Were all the elements introduced in the food incapable of further use, after having served one purpose in the system, the body would be overloaded by the mass of materials it would have to carry, to such an extent, perhaps, as to nearly deprive the animal of locomotion.

From this general view of the *providence* and *economy* of nature, it is unlikely, *a priori*, that the rich supply of calcific matter taken from the deciduous teeth should be allowed to escape from the system as waste, especially when the same kind of materials is needed for growth or repair in many parts of the body.

Now let us for a moment examine the nature of the materials

removed by the absorbents from the deciduous teeth, and see whether they are capable of being re-employed.

In the first place, they are living materials, in one sense at least, although Beale calls all "formed material" dead material. But I shall apply the term *living* material to the ingredients of teeth in which the pulp is not devitalized, to contradistinguish it from the constituents of teeth in which the pulp is dead.

These materials, in the deciduous teeth, are not absorbed *on account* of their degeneration; they are not taken away by these vessels *because* they have become disintegrated, and thereby rendered less capable of performing their functions in the tissues or organs, of which they are constituent parts, than they were *before* the absorbents seized upon them and dissolved their combinations. But these materials — these teeth — are taken out of the way, because they are a physical obstacle that must be removed, in order to give room for their stronger and more enduring successors.

The removal of these materials is the result of physiological or vital action, and is not a pathological nor a chemical process. If it were the latter (chemical action) the pulpless or dead teeth might also be removed by the same process. The dead teeth, though they yield as readily to the action of chemical agents as do the living ones, resist effectually and totally the absorbent forces of the papillæ. These materials, then, are living undegenerate matter, taken up by vital or physiological forces, and carried into the circulation, and there can be no reason whatever for supposing they have become unfit pabulum for other tissues. Some may contend that the lime salts taken from these teeth have lost their connection with the organic matter with which they have been intimately associated, and, for this reason, cannot be appropriated by the tissues. They may take the ground that the phosphates have become disorganized, so to speak, and that these identical ingredients cannot be again assimilated until they have become reorganized, as it were, in the vegetable form, and in that form enter the system again. This objection to the use of the calcareous elements of the deciduous teeth is, I think, utterly groundless, even if they had lost their intimate union with organic matter; for it is altogether probable that the crude phosphates may form this connection with organic matter *within the system*. But if we grant that this combination cannot be effected internally, it by no means

proves that these calcific elements cannot be appropriated by the tissues, for all the authorities I have noticed upon this point agree that the phosphates leave the body in the same form in which they enter it in the vegetable food. If this be the case, the objection to the reappropriation of these materials, on account of the disintegration of the organic matrix, or their separation from organic matter in which they have been held, is without a shadow of foundation.

That this waste of the lime salts of the deciduous teeth would be contrary to the economy of nature, I think I have already shown; and that it is contrary to other analagous processes in nutrition, I think I shall be able to furnish sufficient evidence.

The opinion of physiologists generally is by no means adverse to this view. Lionel S. Beale says: "In the formation of muscle, for instance, from lifeless nutrient pabulum in the blood, the matter which is to become muscle passes through these different conditions:

"1. That of a soluble nutrient matter, or pabulum.

"2. Germinal matter, nucleus.

"3. Imperfectly developed formed material.

"4. Fully developed formed material, muscular contractile tissue.

"5. Disintegrated formed material, which becomes slowly reduced to a soluble state, and is converted, by oxidation, into new substances, some of which pass away, while others in their turn become pabulum for other kinds of germinal matter, such as the white-blood corpuscles and the lymph corpuscles."

Here Beale makes the direct statement that some of the disintegrated muscle tissue may be used again as pabulum for germinal matter. And as far as his authority goes — and I believe there is none greater — the question is already settled that materials which have been used in the formation of one tissue may be afterwards appropriated by others. Dunglinson, Carpenter, Dalton, Flint and Paget, as far as their testimony goes, indirectly confirm this statement of Beale, though they are more reticent on this point than Draper, who iterates the same sentiment in these words: "The constitution of the urine proves that the amount of muscular fibrin destroyed in short periods of time is very great. We cannot estimate the hourly consumption at less than 62 grains. Such a waste must demand an equivalent compensation, if the animal mechanism is to be kept unimpaired; and every care is therefore

taken to omit no means which may incidentally offer for husbanding the necessary materials. The action of the lymphatics illustrates this principle significantly. Passing through all the soft solids, where exudation of albumen from the blood-vessels can take place, they collect the materials that would otherwise go to waste, and add thereto many of the products arising from disintegration and decay of the soft parts themselves."

In regard to the development and maintenance of the adipose and osseous tissues, he says: "From the phenomena of nutrition generally, we may conclude that there are several sources from which *materials* for these purposes may be derived; a part may be obtained directly from the food; a part may be manufactured or fabricated in the system itself, or *may be taken from some locality therein*, in which it has become redundant or useless, and transferred elsewhere to the point at which it is required."

Again, he says: "In the adult the sources of bone-earth are twofold; in part it is derived from the food, and in part from the remodeling and changes of the bones themselves."

The same author makes the following clinching statement, which, if possible, is still more to the point: "As to the sources from which phosphate of lime are derived, though doubtless the food offers it in considerable quantity, there are many reasons for inferring that the identical portion which has been removed from one part is used for the extension of another; and thus we may say that there is a plastic operation continually going forward, a remodeling, so as to adapt the structure to its new conditions if in a growing animal, or to maintain it in good repair if in an adult."

These statements of Beale and Draper, if worthy of credence, are sufficient analogical evidence to satisfy me that the calcific elements of the deciduous teeth may be appropriated in building up portions of the permanent teeth, or any of the other tissues of the body that require calcareous elements.

So also Liebig: "It is obvious that the phosphoric acid which in consequence of the metamorphosis of tissues is produced in the form of soluble alkaline phosphates must re-enter the circulation of this class of animals (the graminivora). It is then employed in forming brain and nervous matter, to which it is essential, and also, no doubt, in contributing to the supply of the earthy part of the bones. In the graminivora, therefore, whose food contains so

small a portion of phosphates, the organism collects all the soluble phosphates produced by the metamorphosis of tissues, and employs them for the development of the bones and the phosphorized constituents of the brain; the organs of excretion do not separate these salts from the blood."

We have seen from the foregoing —

That the process of nutrition is carried on in an exceedingly prudent and economical manner; that the elements taken from the deciduous teeth by the absorbents are not degenerated materials, nor unfit pabulum for other tissues; that the inorganic substance — common salt — may be used over and over again, subserving an important purpose in nutrition, until it is gradually lost with the excrementitious matters. We have seen that portions of the disintegrated muscles, which are composed almost entirely of organic matter, may be converted into pabulum for other tissues; that the same identical phosphates may be used indefinitely by animals whose food is deficient in this essential ingredent; and finally — which is still more significant — we have seen that these lime salts, of the deciduous teeth, are taken into the circulation at the period of life when these elements are the most imperatively demanded in the *growth* of the young animal.

If these positions have been maintained, we have an abundance of analogical evidence to conclude that the calcific elements of the deciduous teeth may be, and are, appropriated by the incomplete parts of the permanent teeth, or by any other tissue which may require these constituents as pabulum.

REPORT

ON

PATHOLOGY AND SURGERY.

BY H. JUDD, CHAIRMAN OF THE COMMITTEE.

IN the report of this Committee for 1872, attention was particularly called to the limit of our knowledge relating to the causes of disease. It was found that but a few of the diseases in the long catalogue could be pointed out whose causes had been definitely determined. Some etiological doctrines, which might be designated as parasitic, were cursorily discussed; and since our last convocation we find that the public mind has been steadily verging toward that point on the scientific horizon which indicates that the parasitic theory of disease is to be, in the immediate future, the most prominent of the theories which have yet been broached upon this subject. Several works, bearing more or less directly upon this subject, have been pretty generally disseminated during the last year, and it will perhaps repay the labor of bestowing upon them a passing notice. The first and most prominent of these is *Sansom on the Antiseptic System*, and, secondly, we have Leber and Rottenstein principally upon caries of the teeth; whilst Wedl's work upon the *Pathology of the Teeth*, having been translated and placed in the hands of the profession generally, has been studied to a considerable extent, and is doubtless having its proper influence in shaping the pathological ideas and opinions of those who have conned its well written pages. Of these works, Sansom's treats of Etiology — only incidentally, but it is none the less interesting or valuable on this account, as it cannot be so readily supposed that facts which have reference to this subject are as liable

to be distorted from their legitimate use, as is too often the case when authors have constructed a theory and then attempt to make all known facts harmonize with and support it.

In the preface the author makes the following statement: "As regards the nature of the causes of infectious diseases, it will be seen that I go with him (Dr. Beale) to his penultimate but not to his extreme conclusions. * * * From a review of all the facts and observations, I have been led to enunciate the theory that the poisons of spreading diseases are extremely minute living organisms, having the characteristics of vegetable growths, analogous to the minute particles of vegetable protoplasm, whose function it is to disintegrate and convert complex organic products; owing their specific properties, in the special diseases, not to any botanical peculiarities, but to the characters implanted in them by the soil in which they first sprang from innocent parents, and from which they are transmitted — this soil, except in the case of their earliest origin, being the fluids of the animal body."

The points to which we would particularly call attention in this enunciation of theoretical views are: *First*. That spreading diseases are due to the action of minute living organisms; *secondly*, that these organisms have the characteristics of vegetable growths; and, *thirdly*, that their specific characters are not due to botanical peculiarities, but to characters communicated to them by the soil in which they first originated — the soil, except in the case of their earliest origin, being the fluids of the animal body.

The first of these propositions, so far as certain diseases are concerned, will, as a general thing, be conceded to be true without controversy. As to the second, the author is careful not to state positively that they are vegetable forms, but we are led to believe that he regards them as such, though the evidence upon that point is not sufficiently demonstrated to warrant an unequivocal statement of that character.

Beale holds that, so far as the cause of contagious fevers are concerned, they are not produced by vegetable forms, but by living animal matter, which originates in the animal body, and which has descended from a bioplasm which was originally in a healthy state. We do not consider this difference of opinion between Beale and Sansom, as to the vegetable or animal feature of the causative agents, as of very great importance, as it is scarcely pos-

sible to distinguish the one from the other in these low forms of life. Sansom lays much stress upon the fact that these causative agents simulate the various ferments very closely, and that they are therefore vegetable; but Williamson has lately shown very good reasons for believing that these ferments are themselves animal, instead of belonging to the vegetable world, as has been generally supposed.

The third proposition involves within itself problems of extreme interest, in a philosophical point of view, the principal feature of which approaches very nearly a corollary which naturally flows from Beale's proposition, that these living agents, in the production of contagious fevers, were descendants of a living bioplasm, which was perfectly healthy, and which was not able to communicate this or any other form of disease.

The question which arises here for solution is, Can a vegetable or animal germ be so influenced by surrounding circumstances as to determine its development into a vegetable or animal form which shall differ essentially from the parent stock?

Both of these statements would indicate that these authors suppose this to be possible, and that the germ of one species may be developed into a form which clearly belongs to another species without resorting to those slow and equivocal influences which figure in Darwin's doctrines of natural selection to bring about this specific change, for Sansom reports several cases in which this actually takes place. Trecul and Hallier are quoted to show that pennicilium, cultivated from lemon, was developed into yeast cells, aspergillus, ascophora, etc.; whilst mucor and palmella have also produced yeast cells, by a peculiar cultivation. If these different species may be thus produced from the same germs, who shall be able to say where these changes will be limited? Can we not reasonably suppose that if these changes do take place, as here stated, in species, generic changes may also be brought about by surrounding the developing germ with other conditions, differing more widely still from those which would seem to determine its development in its ancestral form?

Though there seems to be some evidence in favor of the views put forth by Beale, relating to this question, still it has not yet been clearly demonstrated that such changes can be thus wrought in living beings as to so completely change their nature that the

offspring of a healthy bioplasm shall become, whilst still living, capable of propagating other living beings, which are deadly poisons to the parent stock. We do not, however, propose to spend time in theorizing upon this subject, but only desire to bring before the Association the doctrinal points bearing upon the cause of disease which are found in this work; and as the propagation of one vegetable from a germ which belongs to another species seemed to point to the same law as the one indicated by Beale, we have taken the liberty of placing them side by side for examination. It is possible that these seeming vegetable mutations may be accounted for by applying the well-known law of intermedial forms which obtain frequently in the lower orders of the animal creation during the developmental process.

Leber and Rottenstein have enunciated no doctrine which can be declared to be entirely new in their book upon the causes of caries, but they have collected facts connected with investigations upon this subject, and have used them very fairly, we think, in support of their theory of caries, which recognizes the leptothrix buccalis as an active agent in the progress of this disease.

Experiments also instituted by themselves seem to confirm this view. They do not, however, believe that this parasite is capable of producing caries in teeth, but attribute the initiatory steps to the action of acids. They find this parasite in the dentinal tubuli in nearly all cases of soft caries, whilst in dry caries they think acids may be the sole cause. By experiment they find that this parasite flourishes most luxuriantly in acid solutions. They likewise believe that lactic acid is the one most commonly found in the mouth, and that this is usually formed in the oral cavity.

Wedl's views were hinted at in the last yearly report of the Committee. It is well known that he is not in accord with Leber and Rottenstein upon this subject. He acknowledges, however, that fungi are nearly always present in soft caries; that they penetrate into the dentinal tubuli; in fact, he plainly states that "the proliferations of the elements of the fungus without doubt penetrate and expand the dentinal canals; but according to my observations this cannot occur until the decalcification of the dentine is complete, or at all events until the beginning of this process."

Now if these fungi penetrate and expand the dentinal canals, it seems evident that they must exert some influence in determining

the extent and direction of the carious process; and this is about all that is claimed for them by Leber and Rottenstein.

Now, if they expand the dentinal canals, it is at once evident that the fluids of the mouth will come more readily in contact with the dentinal structure, and as an inevitable consequence — when acid — they will accelerate the process of decay. In another place he says: "If the continuity of the enamel membrane is interrupted by fissures in the enamel, or has become brittle or friable, in consequence of the presence of leptothrix masses," etc. Now, if leptothrix masses may cause the enamel membrane to become brittle and friable in consequence of their presence, how is this change in the membrane brought about? From our knowledge of the habits of fungous growths we should answer: By drawing their sustenance from the structure of the membrane and preying upon the corny cellular elements of which it is composed. If, then, these leptothrix masses are capable of preying upon and destroying the integrity of the structure, why may they not also prey upon and destroy the organic matter found in the dentinal structure? In view of all the evidence adduced, we are inclined to the opinion that these masses of leptothrix do exert an active influence in the process of dental decay.

In this connection it seems proper to call attention to Mr. Hutchinson's work upon *Syphilitic Diseases of the Eye and Ear*. Referring to the symptoms of hereditary syphilitic disease in children, the author says: "By far the most reliable amongst the objective symptoms is the state of the permanent teeth." He states that although the deciduous teeth may present peculiarities they show nothing which is pathognomonic. The central incisors of the second set are, according to this author, the test teeth. He states that in syphilitic patients these teeth are usually short and narrow, with a broad vertical notch in their edges, and their corners rounded off. Horizontal notches or furrows are often seen, but these have nothing to do with syphilis.

Many cases are reported by the author which have fallen under his observation, and which seem to support his theory. Nevertheless we must remember that Mr. Hutchinson is a surgeon in a London hospital, and attends principally to syphilitic patients; and it may be possible that, as in the case of the Lostorfer syphilitic corpuscles, these notched teeth will be found in other forms

of disease. If the attention of the dental profession be turned to this subject it is to be hoped that this question will be set at rest as satisfactorily as was that of the Lostorfer corpuscle by the subsequent investigations of Stricker.

A discovery made by a Dr. Lewis bids fair to result in the establishment of the cause of one more disease whose etiological relations have heretofore been unknown. It is found that in chyluria, a disease quite prevalent in Brazil, and also, we believe, in some parts of the East Indies, a parasite of the species filaria is always found in the blood. Although there can be but little doubt as regards the relation of the disease to this hæmatazoon, still, more observations are needed to place it beyond all doubt. From the great prominence which has been given to this doctrine of the parasitic causation of disease in this, and especially in the report of last year, it might be inferred that the production of disease by other causes was to be entirely ignored.

Whilst disclaiming all such intentions, we are, however, ready to admit that nearly all progress toward the solving of the mysteries connected with these etiological questions has been made in this direction, and hence the prominence given in these reports to these causative agents.

Leaving this branch of the subject with the foregoing remark, we proceed to an examination of some of the phenomena of disease. Interesting questions relating to pathological processes present themselves for discussion on every hand. Inflammation has ever attracted the attention of investigators, and has ever held a very prominent position among diseased conditions. No study connected with pathological research has ever presented more points of interest than this. Mr. Paget states, in his lectures upon *Surgical Pathology*, that "it is no more than the truth, which Mr. Travers has well expressed in his work on the *Physiology of Inflammation and the Healing Process*, 'that a knowledge of the phenomena of inflammation, the laws by which it is governed in its course, and the relations which its several processes bear to each other, is the keystone of medical and surgical science.'" J. Bourdon Sanderson, who wrote the article on inflammation in the last edition of *Holmes' Surgery*, defines inflammation as follows: "By the process of inflammation I understand the succession of changes which occurs in a living tissue when it is injured, provided that the

injury is not of such a degree as at once to destroy its structure and vitality."

Rindfleisch, in his *Pathological Histology*, upon the same subject, says: "If the organism is injured, or meets with any other sufficiently powerful irritation at any point, this has, as a consequence, for the point nearest affected, a series of changes which we designate as the inflammatory process." We propose to spend a short time in the examination of some of the phenomena presented in inflammation, the processes which take place, and the structural changes which ensue. We do not propose to examine all of the phenomena which have been described by authors, but it is our purpose to delineate particularly certain appearances which have given rise to discussion, as different results seem to have been attained by different observers in their investigations. It had been observed that, when a living tissue was irritated, contraction of the vessels of the part took place; and this was generally conceded to be the first visible phenomenon presented in the inflammatory process. Keeping watch of the vessels of the irritated part, it was observed that after a certain time the vessels began to dilate, and this process of dilatation went on until they were found to have reached a size much larger than they were in the normal state. Various speculations were indulged in to account for this distension of the vessels, the favorite of which was that it was due to an exhaustion of the contractile power of the muscular fibers in the walls of the vessels, consequent upon the previous contraction. Subsequent observations established the fact that whilst the vessels in some cases remained contracted for hours, in others the contraction was evanescent, and dilatation soon supervened. Pushing the investigation still farther, it was finally conceded that in some cases the contraction and subsequent dilatation took place so nearly together that the contractile period could not be easily seen; and one step farther in this direction led to the doctrine generally held at this day, which declares that dilatation takes place as a consequence of irritation, in many cases without any previous contraction of the vessels. It will at once be seen that the establishment of this fact necessitates an abandonment of the previous doctrines relating to the philosophy of the dilatation. It might be remarked, in explanation of these changing theories, that they were both formed upon correct observations, but the source

of error in the former consisted in coming to general conclusions from data which were too limited to warrant them. The fact that irritation of a part sometimes produced a contraction of the vessels by no means proved that every kind and degree of irritation produced this result. So far as is known at this day, the dilatation of the vessels of the part is the first constant visible phenomenon in inflammation of vascular tissues, and perhaps of non-vascular tissues also. It has been objected that, as inflammation takes place in non-vascular tissues such as the cornea, in such cases it is impossible that a dilatation of the vessels of the part should take place. But it is observed by Mr. Paget that in such cases dilatation of the vessels lying adjacent to the parts takes place; and as these are the vessels which carry nutritious material to these tissues, they are in reality the vessels of the part, though they are not in the part, which is inflamed. We would suggest, however, that though there are no vessels which carry red blood in the cornea, still there are channels which convey the serum of the blood to this tissue; and it is well known that these vasaserosa do dilate, during the time that the part is inflamed, to such extent that red blood circulates freely through these serous channels. Another appearance presented which has given rise to conflicting opinions is the change which takes place in the motion of the blood. It was formerly generally held that there was an acceleration of the motion of the blood when there was a contraction of the vessels, and many ingenious theories were constructed to explain this phenomenon; but instead of explaining it, at this day pathologists are nearly unanimous in the belief that the blood stream is actually slower when the vessels are contracted than it is in the normal state, whilst an acceleration of the current takes place when dilatation first commences, but that it then gradually grows slower and slower until stagnation supervenes; but the cause of this retarded movement and final stasis is not fully understood. A third point in the study of inflammation relates particularly to the infiltration of the tissues of the inflamed part with fluids and corpuscular elements which are derived from the blood. The principal controversy in relation to this infiltration has arisen in reference to the corpuscular or cellular elements found in it, and which were formerly known as exudation corpuscles. Virchow supposed they were produced by a proliferation of the stable connective tissue

corpuscles; but when von Recklinghausen discovered the wandering cells in connective tissue, and demonstrated their migratory habits, and when the doctrine, propounded by Addison in 1842, and by Waller in 1846, and still again by Cohnheim in 1868, finally made its impress upon the public mind, it began to be recognized that these exudation corpuscles were leucocytes which had escaped from the vessels and become wandering cells, and that when the inflammatory action progressed to a certain point they became pus corpuscles. The opposing doctrines then, relating to the origin of the pus cells, were: that of Virchow, who referred them to a proliferation of the fixed connective tissue corpuscle, and that of Cohnheim, who contended that they were white blood corpuscles which had escaped from the vessels.

This controversy seemed for a while upon the point of being decided in favor of Cohnheim's theory; but the observations of Stricker and others established the fact that the fixed cells of the connective tissue do sometimes proliferate, and it is now generally conceded that, although a great majority of pus cells do escape from the vessels in the form of leucocytes, some are also derived from the other source.

As it is now well settled that leucocytes become pus corpuscles, the question very naturally arises as to the time in the history of this organism when this change takes place, and likewise as to the nature of the change. The microscope fails to respond to this demand made upon its almost illimitable powers. That there is a difference between the two is evident. The leucocyte is capable of being organized into other tissues, whilst the pus cell has no such potentiality. If the pus cell is a degenerated leucocyte, how far has the degeneration to proceed before it should be called pus? Although it would seem that the degeneration suffices to unfit it for organization, it has not proceeded far enough to unfit it for proliferation, for the capacity of pus cells to multiply themselves seems to be well established; consequently they are not dead leucocytes. The intimation put forth by Paget, that the commencement of a fatty degeneration in the corpuscles marks the line between the leucocyte and the pus corpuscle, is totally unsatisfactory, and rests upon no data sufficiently authentic to entitle it to credit, whilst it is opposed by the probability that when leucocytes

have degenerated so as to manifest a fatty metamorphosis, their proliferatory powers will already have been lost.

Among the processes which take place during the course of an inflammation is a breaking down of the connective tissues of a part, especially in case of the formation of abscess. After tissues are thoroughly infiltrated with the inflammatory exudation, the corpuscular elements gather together and the connective tissue elements dissolve or break down, and the space thus formed fills with pus. What determines the point of convergence, and what force moves the cells to this common center? And again, we would ask, what determines the liquefaction of the connective tissues at this point? Is the dissolution effected by the action of the cellular elements which become pus corpuscles, or is it caused by an interference with the circulation of the blood in the part, thus depriving it of its nutritive material?

In relation to the first question, Rindfleisch states that the spontaneous mobility of the cells is brought into play. We have become accustomed to speak of this spontaneous motion of leucocytes, but in our anxiety to explain every mystery we may press this doctrine too far; for whilst acknowledging their locomotive powers, we hesitate to endow them with that half-reasoning consciousness which would be required to direct their course and guide them to a common center. Nor can we see clearly how a transudation from the vessels could suffice to determine the point of the accumulation as suggested by the above-mentioned author. This author also inclines to the view that the dissolution of the tissues in case of abscess is due to a disturbance of the nutrition of the part.

J. Bourdon Sanderson says, in relation to these questions, that they cannot as yet be satisfactorily explained, but remarks that the leucocytes seem to have a tendency to move away at right angles from the long axes of the vessels from which they have escaped; and he also remarks that they have the power of surrounding concrete matter with their own substance, and dissolving it; and further on he states that "It has not yet been demonstrated that these leucocytes actually prey upon the nutritious constituents of the slough, but it certainly appears as if they determined its liquefaction." In relation to the structural changes which ensue in the formation of abscess, we would also notice a structural

change which takes place around the central focus, and which is brought about by an organization of the inflammatory infiltrate of that part which, instead of breaking down into pus, forms a new connective tissue within the interstices of the old tissue elements; and this has been designated in certain locations as an enveloping sac. An illustration of this may be seen in abscesses located at the apices of the fangs of teeth; that is to say, in alveolar abscesses. After an abscess has been opened, and the pus evacuated, organization takes place close to the limits of the abscess, and, as Rindfleisch has it, "embryonal connective tissue quickly forms," which thickens, and upon which granulations appear; from which, according to the last-mentioned author, are produced skin, epidermis, vessels, etc.

The production of vessels in these new formations takes place rapidly, whilst the formation of nerves, lymphatics, etc., takes place more slowly.

It has been a mooted question whether epithelium can be produced from granulation tissue without the influence of contiguous epithelial structures. It is true that in the healing of wounds the formation of epithelium seems to take place usually from the edges of the granulated surface; and it is therefore held by Billroth that epithelium is only produced in contact with epithelial tissues. But in all matters pertaining to pathological histology, Rindfleisch's views are entitled to the highest consideration; and he states that "it has been repeatedly observed that small spots of epithelium appear at some distance from the edges, which grow and finally coalesce with the marginal formations;" and in another place he states that the outermost layer of the granulation tissue constitutes itself epithelium. We would suggest, however, that the evidence adduced in reference to the epithelial spots which make their appearance upon the granulation tissue at a distance from the margin of the granulated surface is not sufficient to settle this controverted point, especially since it is now well known that epithelial scales, apparently dry, scattered upon a granulating surface, take root and grow, thus forming islets, as it were, of epithelial formation; and it would be easy to account for the appearance of the spots noticed by Rindfleisch upon the supposition that epithelial scales had been sown in those locations by accident — an occurrence which must often happen, — and that they had taken

root and manifested themselves, through their proliferation, in the production of the spots referred to above.

Before closing this report, we would state that there is a fair prospect of important results consequent indirectly upon the observation of Lostorfer upon syphilitic blood.

Whilst making examinations of the blood of different individuals, in order to test the truth of Lostorfer's doctrine, Stricker observed certain appearances which induced him to continue his researches in that direction, and he has already published several articles under the head of "Pathology of the Blood," which promise to be of great interest when supplemented by others which, we understand, are yet to follow. We regret that we are not able to give in this report a summary of what he has already written upon this subject.

Although but comparatively few points have been touched upon in this summary view of our knowledge relating to the study of pathology, still we hope it will suffice to bring before the Association interesting questions for discussion, and perhaps give direction to further investigation and thought.

DISCUSSIONS.

Dr. ATKINSON: I desire to congratulate this body on having among them a man who is capable of presenting such a paper as that to which we have just listened.

We have been dealing with *Function*, which means the action of organ or body. Function brings us to Protoplasm, in which leucocytes and every other functioning body has its birth.

Right here, I must dogmatize a little, in stating basal facts. Protoplasm is proteinaceous substance. I will try to nominate the process in serial order, and some misapprehensions of observers, writers and speakers on this point. We say we have first *cells*, which live in protoplasm; out of these are constructed *filaments;* these, bound together, form *fascicles;* these constitute *organs*, and these in their turn are corelated into *systems* — all of which are but channels of, or factors of, *function*, in their order and

degree. All these, in working harmoniously together, lay the foundation of *Physiology*, irregular expressions of which we call *Pathology*, or *Disease*. To understand this, it will be well to bear in mind Function in general, and Function in particular. And that we may get at particular functions, permit me to begin at the small end of Function, and nominate the serial order to the end of the changes so named.

I. Atoms *unite*, in definite measure, under the influx of the endowment of Power to unite. Atoms so combined form II. Molecules. Molecules, in aggregations, produce III. Granules. And these, when regularly arranged, produce IV. Cells. Orderly arrangements of cells produce V. Tissues. Due adjustments of these tissues produce VI. Organs. And co-ordinations of organs constitute VII. Systems.

Thus it is plain that *pathological* actions involve atomic, molecular, granular, cellular, organic and systemic deflections, which must be taken into the account if we wish to comprehend either physiological or pathological manifestation.

Irrigation and desiccation lie at the basis of all nutrition; I mean the use of water — H_2O.

According to the laws of Type, protoplasm is endowed with certain potentialities which may be helped or hindred, arrested or killed, during the efforts to fill out and complete the production of the factors of function, in accordance with the supplying or withholding of enabling circumstances and conditions. If we recognize red and white blood corpuscles as agents in function, and that function (feeding) occurs only in protoplasm, we shall be enabled to grasp the fundamental truth of nutrient function.

The difficulty of the whole question depends upon lack of clearness of perception of the objects under observation, and ambiguity of nominating bodies and processes observed and discussed.

Mulberry-mass has been treated of as a product of an ended process, when it is but an evanescent stage of metamorphic process, that may be physiological or pathological in indication, according to the circumstances in which it is found. Surplus of water (H_2O) lies at the base of all dilution, and excess or deficiency of water is the initial of all pathological change.

If you place the blood corpuscles so that water will pass over them, you may see the globular corpuscles become enlarged and

granulated. They appear to have nuclei, and at the periphery you see a ring, then another and another, until it has expanded beyond the size it was, thus disproving wall or pellicle; and when it bursts, and discharges the nuclei, it resembles vegetable dehiscent scattering of spores.

Take them before bursting, and desiccate them, and you reverse the process, and the granules gradually disappear, until the corpuscle regains its normal dimensions and appearances. If we now drop it into living flesh-protoplasm, it is ready, with the protoplasm, to become an element of the destined tissue of the part.

A red corpuscle is a compressed sphere, and looks to the novice as if it had a well-defined nucleus; but you may prove its transparency by shifting the stage or the light, and watching it during the change, which shows the supposed nucleus to be but the effect of diffraction of the pencil of light.

In the corpuscular and fluid portions of the blood-stream, we have the foundation of physiology and all its modifications.

The young corpuscle makes its advent into the "life current," and ripens into a fit subject for migration. It leaves the vascular domain in the disputed territory between arteries and veins, and escapes the capillaries into the sea of pabulum in the extravascular domain of cell-territory. If it find kindly reception, it at once takes up its abode in the new neighborhood, and is soon made into tissue by taking the place of its immediate predecessor, who in turn pushes his next in file further toward the peripheral end of the fiber of tissue, and so on in order; so that the oldest in the fiber may be shed as epithelial corpuscle, to serve the destined purpose of moulting.

Atoms have intelligence, and are the Master's first workmen. Molecules also have intelligence, but of a more complicated nature, and are workmen of next degree. The POWER, or endowment, by which atoms unite in forming molecules, is expressed in a series of measures called *bonds*. The satisfaction of these bonds of desire to unite, gives us the nature and character of the molecules formed by saturation or satisfaction of these bonds resident in atoms, and ready to be "whipped" into activity by the lash of "*spirit-power*."

This "genesis of molecules" is the result of satisfying atomic monads, diads, triads, tetrads, quintads, etc. etc., to the end of the chapter of the endowment of POWER to unite and to separate, and

reunite on a new and higher or lower basis of bonds. But time and your patience and attention would fail were I to pursue the witching beckonings into the depths of the laws and processes of organology.

The brother who read the paper mistook a condition for a cause of disease. It can, at most, be but the occasion of the deflected nutrition, which he calls "parasitic disease."

He also invokes the "*inflammatory*" process as caused by the presence of the "parasite." There is not time to upset and recast the doctrines of this interesting form of *perverted function*, which is called "inflammation," or I should be glad and most happy to enter fully into it, for the benefit of those who read books more than watch processes "*in actio*," which is the only method by which we can *know* whereof we affirm. My objection is to the wholesale methods of statement in mass which make up this paper, and other labors of the so-called scientists which now unfortunately are recognized as having been erected into the *science* of etiology, physiology, etc. etc., to the exclusion of real knowledge of these departments; which knowledge is only obtainable by the acquisition of the minutia of body and process, a feeble attempt at naming which I have just made.

Dr. JUDD: Dr. Atkinson seemed to take pains in correcting my pronunciation of the word leucocytes. He favors the pronunciation leucocytēs. The word is Greek — *Leukos*, white, and *Kutos*, a cell. The Greek plural is *Kutoi*. Anglicized, we have the singular Leucocyte, plural Leucocytes. I was very much pleased with the remarks of the gentleman, but I apprehend that what he said pertained to dead corpuscles. The changes in dead matter are what he described. He is accustomed to apply the term vitality to many phenomena which are not generally considered vital, as the crystal for instance. In regard to the dried or desiccated corpuscles, I do not deem the evidence sufficient to prove that it can be woven into tissue.

REPORT

ON

PATHOLOGY AND SURGERY.

BY HENRY S. CHASE, OF THE COMMITTEE.

ALVEOLAR PERIOSTITIS — LOSS AND RESTORATION OF THE ALVEOLAR PROCESSES.

AS this disease is so well known I will not describe its theoretical history, but instead, will give the

HISTORY OF A CASE

which I have recently treated.

Miss E, age 19; short; stout body, fat, florid and somewhat coarse complexion, black hair, and black eyes; comes for treatment.

About three years ago she was sick nearly a year with miasmatic intermittent fever. Took various kinds of medicines. Does not know whether she used mercury or not. About the termination of her sickness she noticed that her gums were somewhat swollen; they bled easily, but were not tender to the touch; neither did they give her pain at any time. Soon, her teeth began to loosen, and at the same time she observed a slight slimy discharge from the edge of the gums, and in the morning she found her teeth bathed in this discharge, and moreover had a very bad taste in her mouth; and her friends complained of the offensive odor arising therefrom. These symptoms continued to increase in severity from month to month, yet there was no depreciation of her general health, and although she had been frequently advised

to seek medical advice, she had delayed doing so, until driven to it by the frightful condition to which her mouth had at last arrived.

PRESENT APPEARANCE.

April 17th, 1873.—The gums are of a purplish red over all the teeth of both jaws. They are everywhere hypertrophied, but at their margins particularly, they are greatly thickened and form a *ridge* a quarter of an inch wide. The points between the teeth are still more swollen and of a deeper color. From their under surface flows a viscid, purulent fluid, bathing the teeth, and smelling offensively. The teeth are all present in the mouth, to the number of thirty-two, and undecayed, but everyone is loose in its socket, excepting the *third* molars, and can be moved in every direction. With a flat probe, a twelfth of an inch wide, I can pass up under the gum, toward the ends of the central incisors, five-eighths of an inch, and move it entirely around each root; and I find the alveolar processes entirely removed in front of the roots of all the incisors and canines of both jaws in the same proportion. On the palatal and lingual surfaces the loss is less by an eighth of an inch. The bicuspids and molars are affected about two-thirds of this extent, excepting the palatine roots of the first and second upper molars, which are denuded of bone nearly to their ends. The third molars are quite intact. These molars have only within a few months appeared through the gums. With the exception of the latter teeth, the probe passes around the roots of all. The gums themselves are nowhere absorbed, but occupy the same territory that they did in health, with the exception of a spot on the buccal surface of the upper right molar; but they are nowhere attached to the necks of the teeth.

HABITS OF LIFE.

She partakes freely of meats of all kinds; of coffee, pepper, spices, pickles, mustard and salt she is very fond, and indulges her appetite freely.

TREATMENT.

The diet is to be changed. All stimulants forbidden. Plain lean meat in moderation, vegetables, unbolted wheat bread and milk allowed.

The teeth are to be cleaned three times a day with soap and water. For the present I prescribe no internal medicines, wishing to see what Nature herself can do, with a fair opportunity. I determine, however, to institute

LOCAL TREATMENT.

The remedy which I have best succeeded with on former occasions, and which I have constantly used since 1864, is chloride of zinc paste, made as follows, viz.:

Chloride of zinc	60 grains.
Blood root	15 "

Grind the crystals with the powder, without water, until moisture enough from the atmosphere has been absorbed to make a thick paste. This paste is sticky and is easily carried to and left at any desired location, where it will remain unless removed by water or saliva.

My plan is to cauterize all parts undergoing inflammation, and therefore I shall carry up under the gums the cautery, and reach as nearly the ends of the roots of the teeth as my instrument will allow. I have a very thin steel instrument with a flat blade, about one-twelfth of an inch wide, rounded on the end, but having a sharp edge turned towards the handle. A similar instrument is sold at the dental depots, for removing tartar from beneath the gums. As some distinguished dentists have recommended nitrate of silver, in this disease, I conclude to try its virtues on the left side of the mouth, while on the right side I use zinc chloride. The silver nitrate is to be melted on the end of a thin silver probe. Taking the zinc on the instrument described, I pass it under the gums as far as it will go, moving it around, and up and down the surface of the root of the tooth. I find that a granular substance covers the surfaces of all the roots, feeling as I remove it like soft tartar. I am particular to thoroughly remove this. I have before met with this condition in this disease. The instrument with which this is removed is kept covered with the zinc, so that cauterization can be done at the same time. Much blood flows from under the gums and carries away some of the paste, but enough is left for my purpose.

Before applying the silver nitrate to the left side of the mouth I remove all the granular substance from the roots. The probe

with the nitrate is then passed up and around the roots in as thorough a manner as was the zinc on the other side. The patient exhibits and complains of much pain during the whole operation, which required about two hours for its performance.

April 23d. — Patient came again, it being five days since last visit. No improvement manifest. Granular deposit covering the roots of all the teeth again, but not as much in thickness.

The same treatment as at last visit continued. I find that blood flows more copiously than at the former visit, and that the patient complains of more pain when using the cautery; this is, I think, an indication that granulations are springing up.

April 26th. — The gums look less congested. There seems to be less purulent discharge, and the patient says she has not as bad a taste in her mouth in the morning. She says the right side feels best. I can see that it looks better than the left side.

I use the zinc chloride on the right side, and find that the probe will not extend toward the end of the roots as far as it did at the first visit; there is a semi-soft-solid substance preventing it. This is an indication of new-formed living matter. The granular substance is found covering all the roots again, though still less in quantity than before. Blood flows freely still from the cauterized parts, but of a more healthy color than previously. On the *left* side of the mouth I find a larger granular deposit, and a smaller one of new-formed material, than on the *right* side.

I drop the silver nitrate hereafter, and use the zinc chloride exclusively.

May 1st. — Patient improving. Countenance less florid, with a smoother skin; the gums improved in color, and less thick, especially at the edge, where, however, there is still a ridge. The lobular masses between the necks of the teeth are reduced in siz No purulent discharge to be seen, only a slight glairy fluid is seen on close examination.

This is probably an overflow of new colloid from the blood plasma. On closer examination there is seen a little purulent fluid coming from under the gum between the left under canine and incisor. The granular deposit grows less. The formed material increases, for the probe will not pass up under the gums as far as at the last visit. The resistance to the instrument is about the same as that of a hard-boiled egg with the shell removed. The

teeth are growing firmer. Zinc chloride treatment continued. Wash the teeth daily with tincture of tannin.

May 7th. — Case continues to improve; no granular substance on any of the roots. Gums less puffed and of healthier color. No discharge excepting between left under canine and incisor. The probe does not pass under the gum and around the roots more than a quarter of an inch, and then meets the semi-soft-solid before mentioned.

May 17th. — Continued improvement. Continue same treatment.

June 5th. — Great improvement. Probe passes not more than an eighth of an inch under the gums, without meeting the same resistance of new-formed tissue. The teeth are increasing in firmness, and are almost naturally so, excepting the under central incisor. The gums are healthy in color, excepting the very edge and the festoons.

Heretofore I have avoided lancing the gums, as I did not wish their edges to contract down upon the necks of the teeth, until the distal portions under the gums had become healthy, and the new alveolar tissue formed, as it would interfere with the application of the cautery. I wish this result now to follow, and so lance the gums with a sharp thumb lancet, slitting open every "festoon" in the mouth. Zinc chloride treatment continued.

June 19th. — All the gums look healthy, even to the edges and festoons, excepting a little spot near left under canine and left upper incisor. Here there is a slight glairy discharge. The teeth are all firm. The probe will not pass under the margin of the gum further than in health. In fact it could not be gotten under the edges of most of them without considerable force.

July 21st. — It is five weeks since I have seen the patient; I had not dismissed her, but she thought she was well, and so had remained absent. In the mean time she had returned to her former diet. She now complains that her mouth has an unpleasant taste in the morning. I find a slight discharge from the left under canine and left upper incisor, the same teeth that have all the time lagged in their cure. Still the mouth looks well, and no one would think it diseased even on examination. The teeth continue firm in their sockets; firmer than at her last visit. I take a sharp-pointed instrument and pierce the gum between the roots, and

find that calcification of the new-formed alveolar process has taken place.

A microscopic examination of the granular substance, found on the roots, was made at the third visit, and found to correspond in shape to crystals of sodic chloride.* This salt is abundantly found in protoplasm or living albumen.

August 1st. — The patient presented herself, smiling, and she was better pleased with the condition of her mouth than at any time before. The two teeth that she complained of at the last visit are now well. Being a little fullness of the festoons at those two points, I slit them open with the thumb lancet.

As I think this case of disease has been caused by the constitutional effects of mercury, I am afraid that it may still be having its influence on her system, and, therefore, I shall prescribe medicines with the view of destroying the influence of the poison. She is to take daily, until her next visit, which will be in fourteen days, five grains of iodide of potassium.

The picture which I have endeavored to present of this disease, as manifested in the history of the *case*, is very imperfect. I could only give the totality of its symptoms as I first saw it, and its subsequent differentiation towards health, after therapeutical and hygienic treatment had been instituted. The hidden chemico-vital changes that took place from the commencement or birth of the disease until its final departure, every physiologist and histologist must imagine for himself.

But the physiologist can draw no line of demarkation between health and disease; between physiology and pathology; for only as he observes marked differences between them can he say that *this* belongs to the domain of disease, and *this* to health.

As health is not an entity, so neither is disease; both are merely relative conditions; one a harmonious operation of the various functions of the body, and the other the reverse.

In other phases of biological truth, the same holds good; for who can draw the line between the animal and vegetable kingdoms; or who can point to the exact line between the living and the non-living?

Microscopic research shows that living beings are evolved out of the not living, or inorganic substances, independently of the

* See Lehmann's Physiological Chemistry, Vol. II., Plate 6, Fig. 39.

influence of the living. It is also known that the same newly evolved living matter may grow both into animal and vegetable forms. There is, therefore, no boundary line here; these different states or conditions differ only in degree. In somatic death the functions of the body, as a whole, are destroyed; still there yet remains molecular life for a time; then there occurs molecular death or destruction of the functions of the tissues; still there is inorganic life, if I may be allowed the expression, and it shows itself in chemical processes which take place there, and these same chemical atoms may originate or evolve microscopical life even before there is apparent dissolution of the body; thus is life an unceasing round of chemical actions, expressing itself in various forms from the highest to the lowest, depending on its surrounding incident forces.

Can small-pox, syphilis, scarlet fever, and measles only be propagated, or arise from contagion? The first case of either of these diseases must have arisen *de novo*, at some time far back in the history of the world, or else was evolved out of some other, and may be a less virulent form of disease, which perhaps was *not* contagious.

The diseased living matter which has the power to be transferred from one living organism to another, and there grow and multiply by the plasma of the blood which it feeds upon, is not to be distinguished in form or chemical composition from healthy matter. It differs from the latter only in its power to do mischief. May this power not be owing to the peculiar arrangement of the ultimate organic molecules of the diseased matter?

There are many *inorganic* compounds having the same chemical composition, precisely, that yet have entirely different forms and powers. This difference in properties is supposed to depend on the peculiar arrangement, or juxtaposition of their ultimate atoms. We have reason to believe that the analogy holds good in regard to the powers of living healthy and living diseased matter.

Under favorable conditions, which are under the control of man, *living* matter is evolved out of the non-living, *de novo*, and without the influence of *pre*-existing living matter; then why should not living diseased matter arise, *de novo*, under favorable conditions, without the influence of pre-existing diseased matter?

In the case of periostitis described there was a loss of bone

substance. Was this wasting away a chemical process not under the domain of vital action? Certainly not. It was the result of chemical action under the influence of living tissues, in which the elements of the alveolar processes were taken down and carried off in the blood; but concomitant with this absorption was a purulent flow, having external exit, composed partly, perhaps, of the broken down osteal tissues, but mostly of recently living matter — albumen just poured out of the capillaries, capable of being converted into healthy formed tissues, but unable to do so owing to the unfavorable chemico-vital conditions of the diseased territory, which was undergoing analytic instead of synthetic change.

One remarkable feature in the history of this case is the fact that there was no recession of the gums. They were hypertrophied, but otherwise maintained the same topographical relation to the teeth that they did in health; but undoubtedly if the disease had maintained its course uninterruptedly for a longer time than it did, there would have been an absorption of the soft parts equal to that of the hard tissue. The readiness with which the diseased condition responded to the action of the zinc chloride is, I think, due to the fact of the integrity of the gingival tissue.

The new formed tissues were thus protected from exterior disturbance, and chemico-vital charges could take place here with almost the certainty that they could in the glass retort of the laboratory.

The interesting phenomena of the incrustation of the roots, repeated every few days, until the reparative process was set up, is easily explained; being only a deposition from the albuminous discharge, which was *super*-saturated with sodic chloride, the latter salt being abundantly found in all protoplasms ready to undergo synthetic transformations. Moreover, this patient was a great consumer of this salt as a condiment with her food. No thinking person, I am sure, would confound this incrustation on the root with ordinary *tartar;* but it is analagous, though not the same in chemical composition, to the incrustation found on the ends of those which have been extracted where this disease has been local; only one or two teeth having become sore and loose.

The chemical process by which a pathological condition of the skin is produced by a red-hot iron may be explained, but the chemico-vital charges which take place in the formed tissues when

invaded by the poison of mercury, causing a disturbance in the forces which were then in equilibrium, are yet unknown, but I hope not unknowable.

The future looks bright with the promise that vital chemical charges will be as well recognized, in health and disease, as those which take place in the laboratory of the chemist.

Then will arise a truly scientific system of medicine; for the physician will then be able to select and apply a remedy for each disease, with as much preciseness as the chemist can now select elements to form definite compounds, and again to separate the most complex compounds into their elementary individualities again.

But with this hope, we have the promise too of a host of new diseases, arising *de novo ;* or an evolution of pre-existing forms of disease into more malignant types, resulting from the thousand nameless conditions growing out of new forms of social life, density of population, etc.

But the unknown is eternal, and will continually arise in new forms to beckon on the mind of man to the attainment of knowledge; and when cycles of ages upon ages have past, we never need fear the time will come when the soul can sit down in apathy and say *I am satisfied.*

DISCUSSIONS.

Dr. Judd remarked that he had made some examinations in regard to some of the points touched on in the paper, and had come to the conclusion that wherever there was any discharge, there was chronic inflammation. In one case, where there was no discharge, by passing a broach in he obtained pus corpuscles. He had used both nitrate of silver and chloride of zinc, but regarded it as almost demonstrated that chloride of zinc was the best. In relation to the fine deposit, he stated that some microscopical observers show the form of the crystals to be carbonate of lime. He thought this was so; whether or not similar to the common deposit, he did not know. In relation to the doctrinal points of

the paper, he said there was nothing of greater interest than the theory of spontaneous generation, or the evolution of the living from the non-living. A century ago it was the general belief that animal forms arose out of dead matter. The maggot was supposed to come from the flesh. Redi was the first man to explode this view. His experiments were rude, but sufficient to demonstrate that the maggot did not come from putrefying flesh. It was only necessary to place a net over the flesh, and the maggots did not appear. The contest between both sides of this question has been carried on in every way, until those that believe in spontaneous generation have been driven to the last extremity. In the last few years, the experiments of Bastian have been brought forward to controvert those of Pasteur; but they have not succeeded in so doing. Dr. Judd stated, further, that he did not believe in this doctrine of abiogenesis; that it was not generally held by scientists, and that it must give way to one more rational and one more in accordance with what we know of the laws of nature.

Dr. Atkinson said that a great deal of confusion arose from false nominations, false interpretations and want of knowledge. "Dead matter" is living nonsense! If we knew the methods of organology we would not boggle in this way. The learned gentleman who read the paper, used the terms atoms and molecules in the same sense. Molecules only arise out of atoms. If he had said that molecules depended on atoms he would not have been so ambiguous. In regard to what my brother Judd said, I clear myself from mere dogmatism when I say that I did not mean desiccation in its full sense of dryness. I gave it as an opinion that the corpuscle, when reduced to its original size, after it had undergone dilution and granulation, might, when put into fresh living pabulum in the cell territories, be spun into living tissue. However, this is not now of pressing importance to us.

The work of most immediate importance is that of canceling our novitiate (in which we have been memorizing formulæ) into the ability to comprehend the processes of nature with which we are constantly dealing. This will lift us up above the habit of blindly following the statements of men's apprehensions of these processes, observed long ago and under weights of misconception of body and process in every field of natural philosophy.

The so-called categories of "*science*" everywhere are made up

of, mainly, repetitions of this effete verbiage, without once comprehending the true significance of the words we utter!

Again, I deny what was said in the paper last read in regard to mercury. Mercury is inert, as mercury.

In regard to the chloride of sodium crystals said to be present, they cannot be recognized by the microscope where there is a watery current flowing to dissolve them. The microscope said (to his apprehension) that there were crystals of carbonate of lime. There may have been a little chloride of sodium entangled in his specimen; I would not trust myself to say there was not, until I had submitted it to the test.

Another point. I perceive that there is an evident want of understanding in respect to the difference between *Force* and POWER.

POWER is generic — *Force* is specific. POWER is infinite — Force is a department of power.

Atoms are incapable of being killed. Professor Flagg, a very learned man, claimed to have killed atoms; but we know how that was — he meant molecules when he said atoms.

Wherever POWER is, all modes of force are involved. Now, these molecules get hungry, and they know exactly when they have enough. These are subjects that demand our highest efforts to comprehend, and men ought to be more humble and earnest in their study. There are very many relations under which atoms and molecules stand to each other, and an inverted order of these relations constitutes that part of the field of functions which we differentiate as the department of *Pathology*.

Dr. CHASE: If Dr. Atkinson had paid better attention to what I said he would have known that "the learned gentleman" did not "boggle," but I think brother Atkinson does, in putting words in my mouth which were not my own.

Dr. ABBOTT: I was very much interested in the paper — not that the case was particularly rare, for we frequently have just such cases to treat. As I understand the paper, it was a case of detachment of the gums, absorption of the alveolar process, and death of the periosteum, occasioned by a calculary deposit upon the teeth. The writer carefully avoided, however, to state whether, in his opinion, the periosteum in this case was dead, or intact. In my

opinion, it certainly was dead, and not a trace of it could be found upon the teeth where a detachment had been effected.

As regards its restoration, from my observations, it is *never* accomplished in these cases. And from the observations of the best surgeons in this country, it is *never reproduced* in *any* locality. But what is produced (in operations where, to a casual observer, it would seem a reproduction of the periosteum,) is connective tissue, and not endowed with the functions of the original membrane.

The looseness of the teeth is caused by hypertrophy of the remaining portion of the periosteum, and kept in this condition by the inflammation constantly kept up by the presence of the calculary deposit. Generally, in diseases, if the cause can be removed the cure is simple enough. Is it necessary, then, if the cause (tartar) be removed, to use any material which shall increase the inflammation; or shall we let Nature do the work, we contenting ourselves by simply keeping the parts clean and disinfected? The irritating element having been removed, the inflammation subsides, the periosteum assumes its normal thickness, and the teeth become firm again. Through the remaining portion of the periosteum, the alveolus is undoubtedly partially restored again.

The disinfecting dressing that I use is,

℞.—Carbolic Acid, ʒ i;
Glycerine, ℥ i;
Aqua, ℥ vij.
To be used with a syringe once a day.

Dr. WALKER said that after removing the tartar, he used a solution of equal parts chloride of zinc and water, and then, on alternate days, a preparation as follows:

℞.—Carbolic Acid, ½ ʒ;
Iodine, ½ ℥;
Glycerine, 3 ℥.

Dr. OSMOND gave the following preparation:

℞.—Potassii chlorate, ʒ ij;
Tinct. Arnica,
Tinct. myrrh, āā ʒ iv;
Aqua rosæ, ℥ vj.
Apply five or six times a day.

Dr. MORGAN said that every disease should be treated on its own merits. General principles furnished the only philosophical

guide to practice. Whenever we deviate from this to prescription practice we become an arrant set of empirics. Sometimes we want stimulation, and again a reduction of the vital force. A gentleman said that periosteum is never reproduced. I think it is very frequently reproduced. I don't know that it ever is on the root of the tooth, but I know it is elsewhere.

Dr. CHASE: I have often found an aching tooth undecayed, and when the pulp cavity was opened, a greater or less portion of the pulp calcified. In these cases I apply arsenic and treat for death of the pulp.

Dr. HERRIOTT thought the periosteum could be reproduced. If not, he could not see why teeth get so solid as they do. In many cases he thought heroic treatment was resorted to when it was not necessary. Homœopathy had done a great deal of good by reducing the doses of those in the regular practice, though he was no *little-pill* doctor himself. Where the nerve was left all right, he thought the periosteum could be reproduced.

Dr. OSMOND suggested that if the pulp were not already dead, such treatment as that proposed would kill it.

Dr. JUDD: I arise to correct a misapprehension. We are not discussing a common case of impaction of tartar. There is no impaction of tartar. It requires a microscope to distinguish the crystals. This case is entirely different — very much more rare. We are all very well aware that in a common case of impaction of tartar the removal of the tartar is all that is necessary. But I want to call attention to one fact; there are certain diseased conditions in which the cause has passed away before it has come under our observation. They have become chronic, as when inflammation exists, and continues to exist after the cause has passed away. We see this in the diseases of the throat, nasal passages, and other mucous membranes. We need something to stimulate the vessels to resume their normal caliber.

Dr. BUCKINGHAM said that the remedial action of chloride of zinc and carbolic acid was the destruction of the parasites, thus getting rid of foreign matter.

Dr. STELLWAGEN said that Dr. Chase did not go into the action of these agents, because he presumed every gentleman knew that the object was to constringe the surrounding parts and get rid of the parasites.

Some sporadic discussion then arose as to the use of the words periosteum, pericementum, and peridonteum. Dr. Stellwagen remarked that after inflammation had set in, he would defy any one to show any line of demarkation between the pericementum and the periosteum. Dr. J. S. Smith called attention to Wedl's distinction in terms — he called that which covered the root, the *root membrane*. The discussion was closed upon that topic by a remark of Dr. Judd, that cementum was true osteal structure.

Dr. Chase: I deny that Pasteur, or any one else, has demonstrated that 300° of heat does not destroy germs. Because living things developed in Pasteur's flasks after heating them to 300°, that scientist assumed that the germs of these living beings had resisted that degree of heat. He saw no germs, and with the most powerful microscope no germs could be found in the infusions in which living beings were evolved in Bastian's experiments. This gentleman was successful in over fifty experiments; and Wyman, Sanderson, and others, have corroborated the truth of his results by their own experiments.

REPORT OF THE COMMITTEE

ON

DENTAL THERAPEUTICS.

By H. L. SAGE, Chairman.

THE past year has not been so prolific in discoveries in the way of *new* dental remedies, and their employment, as might be wished by the friends of progress; but it is, nevertheless, a source of gratification, that signs of advancement "all along the line" are quite perceptible — at least, the interest among the *enrolled* has not seemingly been abated.

One short year is a mere point of time in the ocean of progress, and it is only by a patient and hopeful spirit, allied with unceasing vigilance and effort, that any results worthy of the name can be chronicled.

As the results of "original investigations" may be somewhat meager, it would naturally be expected that there would be more material for a report, culled from the aggregate *revealed* experiences and discoveries of the dental profession in this and other countries. And yet the supply from the latter source is not unlimited, of that which is *new*. While the interest of a report must depend greatly on the facilities possessed by the Committee, for collecting from dental and medical literature, and other sources, any matter which may be of real, intrinsic worth — the results of personal knowledge and experience of, and in, the therapeutic value, manner of employment, and scope and direction of activity and usefulness of medicinal agents, are still more difficult of attainment.

Hence it is that not a little anxiety and responsibility must attach to those upon whom devolves the duty of presenting reports

before this body, and in some cases, also, some measure of diffidence, and a shrinking from the task.

Though, as before stated, since the last meeting of the Association, very few *new* remedies have come to light, the field of usefulness of others, with which we are somewhat familiar, has been enlarged.

The subject of constitutional treatment, and through it the effects upon the development, structure and composition of the teeth, and the prevention of dental caries, is yearly receiving increased attention, thereby bringing into view with greater distinctness, the proofs upon which rests the theory of the chemico-vital action of caries.

The remedy which has recently attracted the most attention, and excited the greatest interest, and elucidation of its merits in this direction, is the Syrup of the Lacto-Phosphate of Lime — the formula for which has been published in some of the dental journals. It is said that to the French physicians is due the honor of having first exhibited the lime in this form.

The greatest advantage claimed for this preparation over the simple pulverulent phosphate of lime is, that it is more easily appropriated by the system, *i. e.*, more readily and largely assimilated or absorbed by the blood and tissues; the phosphate, instead of passing off as waste material, being utilized to a much greater extent than formerly; for the reason that, being fitted for reception in the stomach by previous digestion or dissolution in lactic acid, the functions of the digestive fluids are rendered less onerous by the assistance afforded them.

To condense and simplify the statement — the natural acidity of the gastric juice is due to the presence of lactic or hydrochloric acid — whether the former, the latter, or both, is a matter of some dispute.

But it has been shown that, "if the gastric juice is sufficiently concentrated, it will dissolve phosphate of lime, and that *both* these acids seem capable of imparting solvent properties to the digestive fluids, and that one may be substituted for the other." (Piggott's *Dental Chemistry*, pages 121 and 123.) Dalton says (*Physiology*, p. 139) that "Bidder and Schmidt found in most of their analyses hydrochloric acid in place of the lactic; that Lehman regards the latter as much the most abundant of the two; that Robin and Verdeil

also regard the acid reaction of the gastric juice as due to the lactic acid; that Bernard has shown, by a series of well contrived experiments, that the free acid of the dog's gastric juice is undoubtedly the lactic; and that the hydrochloric acid, obtained by distillation, is a product of the decomposition of the chlorides which enter into the composition of the fresh juice." But though lactic acid is a solvent of the phosphate of lime, the gastric fluids do not contain it in sufficient quantity to effect the solution of an adequate amount. Hence the waste, and hence very slow effects are produced, when it is administered in the usual manner, because it enters the circulation in such minute quantities. Hence, also, the lacto-phosphate of lime greatly facilitates digestion, and as effect follows cause, the appetite is increased and nutrition stimulated, while it is tolerated by the most delicate stomach; so that its exhibition would seem to be specially indicated for females during the period of gestation and lactation, when that organ is so likely to be sensitive *to*, and intolerant *of*, ordinary remedies, and when the teeth are so prone to deteriorate by the abstraction of the lime salts, and the general diversion therefrom of the nutritive elements.

It has long been maintained that the constitutional employment of the phosphate of lime, has not only been of benefit in scrofula and phthisis, but more especially in rachitis, and when the teeth are deficient in the mineral constituents, though in the latter direction, so far as we are aware, there are no reliable data of the results of its exhibition.

It would seem that young and soft teeth especially would respond to a thorough and systematic course of constitutional treatment, and that hardly a more interesting field for study and experiment could be entered upon. At least, it is a subject which merits the earnest attention of the profession.

There are two classes of theorists — one of whom maintains that the structure of the teeth can only, or at least *best*, be improved in character by supplying, in the *food*, those constituents in which they may be deficient, which is usually and eminently the mineral; and to this end there should be a proper selection and preparation *of* and an admixture, *in* the food, of earthy and animal matters; the introduction into the system of the former, with the ordinary, every-day pabulum, being more in harmony with the organic functions, and therefore more easy of appropriation by the bones and teeth,

than if taken in the form of the simple powdered phosphate, or in combination with acids, or other vehicles. Great stress is therefore laid upon the importance of the persistent use, with other kinds of food, of the *farinaceous;* from which the lime, constituting the hull or outer portion of the kernel, has not been abstracted by bolting.

The other class, though, for the most part, admitting the influence of diet in this direction, maintains that the same or even more rapid results are attainable by the medicinal exhibition of the phosphate; more particularly since the introduction of the lime in solution with lactic acid.

Both methods of treatment are doubtless beneficial, though it may be urged, in favor of one over the other, that it is more difficult to influence *our* patients in the matter of diet than to persuade them to make use of a pleasant syrup like the lacto-phosphate of lime. This, as usually prepared, contains between two and three grains of the phosphate to the teaspoonful or fluidrachm. Wyeth & Brother's preparation contains two grains to the fluidrachm.

Dose — three times a day after eating; for children, a teaspoonful; adults, a dessertspoonful; for infants, in proportion.

Previous to the employment, in this country, of the lime in solution with lactic acid, phosphoric acid was sometimes employed as a solvent. The *Dental Register* for 1871 gives the following formula, with an editorial indorsement.

The formula is here reproduced, without knowing which of the preparations the writer would now consider the best:

"℞ Acid Phosphoric, dil. U. S. P., q. s.

"Phosphate lime, fresh precipitated, q. s.

"Dissolve the phosphate of lime to saturation in the acid, filter, and add an equal quantity of pure glycerine, or of sugar — preferably the glycerine (in case of anæmic condition, phosphate of iron may with advantage be added; also made tonic by the addition of sulph. quinia)." This contains about 5½ grains to the fluidrachm.

Which is preferable, the lacto-phosphate, or the phospho-phosphate, when administered for the definite purpose of improving the character of the teeth, must be left for decision to those best capable of judging. But it would seem that the former, as being less foreign, and the most grateful to the stomach, would be the most efficient, since the most perfect digestion must be had, when this

essential point is reached — the lactic acid, of itself, having been, it is said, employed with good results in certain forms of dyspepsia.

There is another direction in which it has been suggested that the exhibition of the lacto-phosphate might prove beneficial.

It is in cases of retarded dentition, when the same is consequent upon a deficiency of the lime salts in the blood — if such retardation is ever dependent upon such a state, as it thus appears, aside from any mechanical obstruction from crowded permanent, or persistent temporary teeth.

There is quite a difference between the checked eruption of a tooth from a cessation of development, and its non-appearance from other causes, after its full development is accomplished; for, in the latter case, it is not so certain, theoretically speaking, that the administration of the lime would cause the lagging tooth to appear. We can conceive how this might be beneficial if, from any change in the system, the supply of mineral constituents were cut short, and the further growth of the tooth (root) suspended, and withal its eruption; for according to Tomes (*Dental Surgery*, p. 293), a tooth, in normal process of eruption, is pushed forward and emerges from the gums long before the root has attained full length, the latter process progressively effecting the movement toward the surface, the absorption of the overlying alveolus induced by the pressure permitting its emergence, which, if delayed until after the completion of root development, must be accomplished, if at all, as he supposes, by the contraction of the lower portion of the socket, which latter process also forces the tooth surfaceward, thus causing its final appearance, the pressure of the crown inducing, as in the former case, the absorption of the obstructing tissues — the contraction of the socket being consequent on a deposition of bone at the part undergoing change.

Thus, there must be, if this theory is true, in all cases in which teeth are erupted late in life, an increased supply of ossific matter at the sites of the roots of the decayed teeth, thus giving a new and extraordinary impetus to the sluggish forces.

But is not this, if of the nature set forth by Tomes, a pathological process, depending on an over-stimulation of the functions in this region, and inducing a determination thereto, in excess, of bone pabulum? If induced by *gentle* local friction from any cause, as in mastication, which is seemingly not impossible, the process would

be normal, or the reverse, were the friction severe enough to excite inflammation. In either case, there would be an increased supply of blood thitherward, and possibly ossific matter enough to produce a thickening of the alveolus.

In case of the loss of contiguous teeth, which might have, in a measure, afforded protection to the part, it would thus be exposed to more violent friction, from a more free contact of the food in mastication, thus stimulating and engaging the forces to greater activity in this direction.

It is barely possible that this deposition of bone on the sides and bottom of the socket, may be what Harris calls "exostosis of the alveoli," on which is sometimes dependent the elongation and loosening of teeth, simultaneously with, in most instances, and as age advances, the further and gradual solidification and calcification of the osseous system.

May not the conditions be similar when teeth are erupted at the ages of thirty-two, forty, and forty-five, as in cases cited by Mr. Tomes?

Except from this, or the cause before mentioned, how are we to account for the resumption of the work of dentition, admitting that development is completed?—for, according to Tomes, if a certain tooth failed, though present in the jaw, to make its appearance, and the corresponding tooth on the other side was normally erupted, the missing tooth would be found to be, equally with the other, fully developed.

If the completion of dentition, in such an instance, depends upon contraction and exostosis of the socket, might not the same conditions extend to the alveoli of the adjoining teeth, and thus cause mischief?

It is difficult to see how such a process could be confined to the region of the imprisoned tooth, *i. e.*, nutrition diverted to that point alone.

But may not the *development* of a tooth, simultaneously with its *cutting*, be so very *gradual* as that its tardy eruption may be due to *this* circumstance? If dentition is sometimes delayed a longer or a shorter period by retarded *development*, the administration of the phosphate of lime *might*, perhaps, be of service; but whether it *would*, or not, when full development has been attained, is a matter more difficult of solution.

There is likewise another direction in which the exhibition of the lacto-phosphate would seem to be indicated, and that is where, after the mechanical movement of teeth, in cases of irregularity, it is desirable to assist in the reproduction of the bone, lost by the enlargement and absorption of those portions of the alveolus, or socket, from which, and toward which, the root of the tooth has moved, or rather the filling up of the spaces, or sites, which were occupied by the root before the movement was accomplished.

If the time usually required for the moved teeth to become firm could be shortened, "it were a consummation devoutly to be wished," as the patience of the patient would not be so severely taxed, as is sometimes the case, to such an extent as to lead those of weak determinations to prematurely abandon the use of retaining appliances, with the unfortunate result of permitting the regulated teeth to partially or wholly regain the positions occupied previous to the correction of the irregularity.

It would seem that constitutional treatment might be efficacious under such circumstances, especially when the bones are illy nourished, or where the supply of bone phosphates does not keep pace with the depravity or deficiency, consequent upon a too rapid growth of the body, or in which nutrition may be directed to other portions of the system at the expense of the osseous, or where, after reaching maturity, all the constituents of growth are more sparingly supplied. The thought may be worthy of consideration, and experiment lead to valuable results.

Recently there seems to have been rapid progress attained in the treatment of partially dead and sloughing pulps — judging from the testimony of some reliable and prominent English and American dentists.

A new method of local treatment for such has been advocated and practiced to some extent, and a new remedy introduced for the purpose, by Mr. Oakley Coles, of the Odontological Society of Great Britain, the employment of which he has found satisfactory, after nearly a year's trial.

Advantage was taken of one of the constituents of the gastric juice, viz., its organic matter, called *pepsine*, the powdered pepsin being acidulated with dilute hydrochloric acid, to intensify its action, with the addition of glycerine, to render it pasty. Lactic acid may be, and sometimes is, substituted for the hydrochloric.

In *Piggott's Dental Chemistry*, we are told that "hydrochloric and lactic acid can alone constitute, with pepsin, an active digestive fluid;" and in *Dalton's Physiology*, that "the free acid is an extremely important ingredient of the gastric secretion, and is, in fact, essential to its physiological properties; for the gastric juice will not exert its solvent action upon the food, after it has been neutralized by the addition of an alkali or an alkaline carbonate."

The Missouri *Dental Journal*, February, 1873, gives the French process of manufacture of Boudault, and also that of Mr. Sheffer, of Louisville, Kentucky, with the relative strength of the different preparations in the market. The crude pepsin is obtained from the mucous membranes of the stomachs of sheep or hogs, which is further prepared for use by chemical process.

Wonderful solvent properties are attributed to this agent. When hydrochloric acid is combined with pepsin, it forms — according to Professor C. Schmidt — "soluble compounds with albumen, gluten, chondrin, etc." Acidulated pepsin readily dissolves coagulated albumen, while the aqueous solution does not.

Mr. Sheffer has dissolved three thousand parts coagulated albumen with one part pepsin. It is also stated that one part pepsin dissolves sixty thousand parts of milk.

Pepsin is, when freshly precipitated, very soluble in water; when dry, only sparingly soluble. The aqueous solution is very nearly neutral.

Pepsin is coagulated by boiling, thus neutralizing its solvent power. Alcohol precipitates it, and greatly impairs its digestive properties.

Pepsin is likewise injured if subjected to a temperature much above 100° F. Hence, hot drinks, when taken into the stomach, retard digestion, and are, from this cause, injurious.

Pepsin acts upon dead tissue only, and causes no pain.

Henry S. Chase, M. D., D. D. S., refers, in the Missouri *Dental Journal* for April, to his brief experience with this agent, as of a very satisfactory nature, with a recommendation to all to try it. His method of treatment, and that of Mr. Oakley Coles, do not essentially differ.

A *resumé* of the indications *for*, and the manner *of*, its employment may not be inappropriate.

What are the indications for its use?

First. When a pulp is partially dead and sloughing (or in such a highly inflamed or congested condition as to have lost all recuperative power), in order to remove the affected portion by dissolving it, the healthy being left intact.

Second. To remove by digestion (afterward syringing) portions of pulp, dead and inaccessible, or with great difficulty accessible, and incapable of being removed instrumentally.

Third. When a pulp has been partially destroyed by arsenic, to separate the devitalized from the living portion, preparatory to capping the latter.

Precisely in what manner should the pepsin be used?

First excavate the cavity partially, though about the borders pretty thoroughly, dry it perfectly, place the pepsin in contact with the exposed and partially dead pulp, and confine it in the cavity by sealing with wax, adapted to the walls with a hot instrument, (or, as some say, wax and cotton), leaving it undisturbed for two or three days, using no creasote or anything of the kind previous to making the application, and syringing with tepid water before and after. This being done, the remaining pulp tissue is touched with creasote or carvacrol, capped with oxychloride of zinc, and the cavity filled, temporarily at first, and permanently afterward, or permanently at once, according to the judgment of the operator.

This is the gist of what is *practically* known or inferred regarding dental pepsin, the main object being to save, by gently detaching the dead from the living — not neglecting, as a final requisite, after the careful nursing and recovery of the living portion, its permanent protection, by the insertion over all of an indestructible material.

In regard to the deleterious effects of certain medicines upon the teeth, it is so generally known as to have become a matter to which attention has ceased to be directed. Various medicinal preparations containing acids are about the only class which are supposed to have, by their exhibition, a local action on the teeth, and probably the only ones for which physicians and dentists have occasionally prescribed antidotes; while they are, in very many, if not the majority of cases, administered without the attention of the patient being directed to their injurious effects in this respect, and the manner of neutralizing them. It is not generally known

that one or more of the preparations containing potash, which are in extensive use as medicines, are very destructive to the integrity of the dental organs. If this is the case, the fact should be widely known, and antidotes sought and prescribed; and it is for this purpose, and that future observation and experiment may be brought to bear in this direction, that the subject is here referred to.

The bromide of potassium, which is largely employed as a sedative in the treatment of neuralgic affections, has, so it seems, after frequent and not very prolonged use, greatly impaired the structure of the teeth — at least the proof of this has seemed apparent from recent, though limited, observations in this direction.

For example: A lady with teeth in good condition, of good quality and finely polished, found it necessary to call a physician, who prescribed the bromide of potassium. After a daily and exclusive use of it for nearly a year, the lower bicuspids more especially, became so soft as to be very easily cut — almost as easily as chalk. Other cases have been noticed.

After a short personal experience with this remedy, the inferior teeth became very sensitive about the necks, and, though the sensitiveness disappeared in a measure, after ceasing to use it, the bicuspids are permanently injured on the cervical portions.

When and *how* does this agent act?

As is supposed, when the fluids of the mouth present an acid reaction, the bromide of potassium, by contact therewith, becomes a destructive agent, forming hydrobromic acid, which rapidly corrodes the enamel. Therefore, the medicine ought not to be administered in such cases without the after and immediate rinsing of the mouth with an alkaline solution — as that of the bicarbonate of soda.

The indications of rapid deterioration of the teeth, *seemingly* from the exhibition of this medicine, and that the attention of the profession may be enlisted in this direction, with a view of eliciting further information, may serve as an apology for offering these suggestions, and also that the results of a few limited and incomplete experiments on the dry and extracted teeth may be chronicled, which seem to confirm the truth of these statements.

The most prominent acids found in the saliva are, according to Piggott, the "hydrochloric, acetic, lactic, oxalic and uric."

Very recently, a number and variety of teeth, temporary and

permanent, old and young, were immersed in water, one ounce; bromide of potassium, twelve grains; hydrochloric acid, two drops, at different times, and for periods ranging from three to six, twelve, and twenty-four hours. This softened and corroded the enamel, leaving a white powder on the surface, while shavings of cementum, one-fiftieth of an inch in thickness, could be cut from the roots, and remained attached by the ends to the necks.

The results were varied by the quality of the teeth.

At another time, some teeth which had been whitened several months previously (by placing them for a few seconds in a solution of the chloride of soda, an acid being immediately added, and the teeth quickly washed with water,) were subjected to experiment, when full as much effect was produced by immersion in a solution of the strength of the first for a period of three hours, as was in the first instance during a longer time.

Several teeth, varying in age and density, being immersed in a solution composed of water, one ounce; bromide of potassium, twelve grains; acetic acid, three drops, the enamel was corroded to some extent, while the cementum could be shaved off in strips of about half the thickness, as when the effect was produced by the addition of the hydrochloric acid.

In the case of some very hard teeth not much effect was produced.

When the solution was made by the addition of six drops of acetic acid, and twelve grains of bromide of potassium to the ounce of water, for about forty-four hours, the teeth were all acted upon — the cementum being easily shaved off to the thickness of one-fiftieth of an inch, while the enamel was badly corroded.

In a solution composed of water, one ounce; bromide of potassium, twelve grains, and oxalic acid (crystals), six grains, were placed a variety of teeth for a period of forty-eight hours. Most of these were acted upon badly, with varying degrees, though some were not much affected. In most instances the enamel was much corroded, and the cementum softened so as to be easily shaved to about the same depth as in the other case — one-fiftieth of an inch, or more.

A cuspidatus, molar and bicuspid were immersed twelve hours in an aqueous solution of bromide of potassium, twelve grains to the ounce. No effect, excepting on the cuspidatus, in which the

surface of the enamel was softened, and the cementum could be cut from the surface in thin strips. But the action was less than when the acid was added.

All loose tissue, dried blood, tartar, etc., had been removed from the teeth before subjecting them to these experiments, but other acids were not used, for want of time.

Perhaps the iodide of potassium would also be found to exert a deleterious local action on the teeth, to a greater or less extent, varied by the character of the fluids of the mouth, and the quality and composition of the former. In these days of the frequent administration of medicines, more frequent, perhaps, than formerly, because of the increasing multiplicity of medical men and remedial agents, and the greater publicity too, through the press, of the so-called merits of secret and patent preparations, it would not be surprising should the teeth also suffer from the local or constitutional effects of over-medication; for which latter, it is apparent, the present facilities afford, with many ample, temptations to try the effects for real or fancied ailments — many of the former, no doubt, being a consequence of the carrying out of this tendency.

But this does not make less obvious the fact that many remedies of real value, and indispensable in medical practice, are sometimes destructive to, or impair the integrity of, organs with which they may come in contact, unless agents are employed to prevent it; which effects, so far as the teeth are concerned, can usually be neutralized when of a merely local character, without impairing the remedial action of the medicine. And it is quite likely that much yet remains to be learned as to the specific action of certain acid and alkaline medicines in the production of caries, or whether or not they have such action, and the combinations necessary to produce it, and the steps to be taken to prevent it.

In the report on Dental Therapeutics for 1872, allusion was made to the action of carvacrol on sensitive dentine, in which its merits as an obtunder were briefly set forth, it having been first suggested, for this *special* purpose only, by Dr. J. R. Walker, of New Orleans, as was then stated. Subsequently this agent was put into the hands of several prominent members of the profession, who have, for several months, employed it with great satisfaction, not only in this but in other directions; the results of our own experience, and that of others thus far, indicating that it is a more

valuable addition to dental and medical practice than has been supposed, with a *much wider* range of usefulness than was at first claimed for it; not only that, it has been produced in much greater purity and strength than at first; so that it seems to be quite all that can be desired as to quality. From what has been developed in its manufacture and in dental practice, it seems to possess in full strength, or diluted to meet various indications, antiseptic, disinfectant, sedative, mildly caustic and escharotic, gently styptic, stimulant, irritant, rubefacient and carminative properties.

Undiluted, in which state it is employed in most cases, it has more powerful action than glycerole of thymol, and, for some purposes, is more efficient than creasote, while it meets some indications not met by either. Diluted with water in about the proportion of one to three drops to the ounce, it has been found to afford great relief as a gargle in tonsillitis (*cynanche tonsillaris*), the effect being immediately apparent, and the recovery speedy by a few applications. For example, an intelligent dentist awoke in the morning with a very sore throat. A drop of the carvacrol in a wineglassful of water used as a gargle gave immediate relief. Two more gargles during the forenoon effected an entire cure before night. The strength of the gargle can be increased, when more powerful action is required.

In the more severe forms of tonsillitis it would probably greatly mitigate if not cure the disease; and it is believed, from what is known of its properties, and from its *limited* use in this direction, that it would *always*, or nearly always, prove beneficial in inflamed and ulcerous mucous membranes where local treatment could be had. Mouths irritated and made sore by wearing plates are speedily relieved.

We have frequently taken it internally, in very minute quantity, by way of experiment, and for the effect it might have in relieving bronchial irritation; though in the absence of other than personal experience, would not like to recommend its employment in this way, though in our own case the result *seemed* to be satisfactory, and the relief positive — this being the only remedial agent employed for the purpose.

But future and careful experiment can alone determine its full value in general medicine and surgery. It is safe to say that it is not so necessary as with creasote, chloride of zinc, etc., that the

patient does not swallow the slight excess that may find its way to the mouth by judicious local application, or that it be so *carefully* confined to the immediate vicinity of the parts under treatment. But we would not underrate the importance of neat and careful handling of this agent.

In odontalgia, proceeding from exposed pulps, it has remarkable power — the cessation of the pain being instantaneous in many cases, where the usual remedies prove of no avail — the effect of a single application often lasting a week, and in many cases even longer. Of course, it might not prove effectual in every instance. This would be expecting too much of any remedy.

In the hands of the public it would not be likely to abate odontalgic pains so rapidly, perhaps not so fully, as if the cavity was, previous to the application, partially excavated, so that the free contact of the medicine with the pulp could be had; though it seems to penetrate carious tooth substance with greater facility than is the case with most agents of this nature.

Dr. C. E. Francis says, in regard to its efficiency in odontalgia: "It has remarkably soothing effect. I have used it upon exposed pulps with much satisfaction. In cases of odontalgia, arising from irritated and congested pulps, it acts with magic influence. In several cases of terrific toothache, after trying aconite, chloroform, creasote and carbolic acid with little or no effect, I have allayed the pain in each case *instantly* with a touch of the carvacrol. If it had no other virtue, it would, in such cases as these, be an invaluable remedy." For sensitive dentine, "he does not find it much different from creasote or carbolic acid." But it is proper to state that he was then using an article much weaker than that now prepared.

Dr. W. H. Atkinson, than whom a better judge of the action of dental therapeutic agents can scarcely be found, says: "I find carvacrol to be an acquisition to the remedies used in dentistry. It meets some indications not yet met by anything else known to me. It does not cause 'shock' when applied to raw surfaces at all, except when too cold or cool to not disturb super-sensitive tissue. Its 'taste' is objectionable to most, and its 'smell' to many. It fills nearly every indication of creasote in less pronounced degree. I deem it well worth the trial of a much wider introduction in dentistry and general medicine and surgery than it yet has attained."

Dr. G. A. Mills thus refers to his experience with this agent: "I have used the carvacrol since I first received it, which was some time in the early winter. As a substitute for creasote I am not ready to indorse it fully, or either thymol, for I think they are decidedly useful where the carvacrol would not be.

"As an escharotic, it is *mild*. As an antiseptic, it is *mild*. As a stimulant, it is *mild*. As an obtunder, it is quite efficient, particularly in highly organized tooth structure. In such cases I have had a very satisfactory use of it. I am inclined to the opinion that, because of its mild stimulating qualities, is due its kindly action on the highly organized tooth. I do not think that it possesses the disinfecting qualities in anything like the degree that creasote or thymol does. I am inclined to think that a longer acquaintance with it will develop something useful, and worthy a place in the list of our remedial agencies."

To return to our own experience with, and impressions received concerning it. Carvacrol has an odor similar to creasote. Its taste is sweetish at first, afterward scratching, peppery and persistent. If swallowed undiluted, even in small quantity, it is usually and temporarily irritating to the fauces. Its taste is liked by some; disliked by most. Likewise, its odor is objectionable (though slightly to most) and the reverse.

As a gargle, it renders the mouth refreshingly sweet. Our own experience would also indicate that it is useful for disinfecting root canals, for applying to cavities previous to filling, and to pulps before capping. We incline to the opinion that, as a disinfectant, it is quite as efficient as creasote or thymol, while it is more penetrating; to which latter fact, as well as to "its mild stimulating qualities," may be due "its kindly action on the highly organized tooth." To this, also, may be due the effect it has in obtunding the sensitiveness of dentine so quickly; for, if applied to burs while excavating, during the use of the engine, it not only lessens the friction but reduces the sensitiveness, and is, in the latter respect, the best agent that can be employed.

For mild cases of abscess carvacrol is certainly efficient.

One advantage possessed by carvacrol over creasote is, that it makes its *presence* more severely felt when it reaches the seat of the abscess, and thus more apparent to the dentist, than is the case with creasote. While it produces a burning, peppery sensation, it is not

so likely to excite inflammation of the tissues when confined; for instance, in case of an abscess which has not discharged through a fistula, or caused destruction of tissue enough to produce one. A tooth may be sore to the touch, the gum swollen considerably, and there be no discharge of pus, or it may not be present.

If, now, the pulp-canal be cleared of the *débris*, and cleansed, an injection of carvacrol be made into the abscess through the apical foramen, or through the foramen slightly enlarged with a very small drill, and the pulp-canal temporarily filled with saturated ("carvacroled") floss silk, likewise the orifice of the cavity with the oxychloride of zinc, there will be produced (so far as some experience in this direction indicates) nothing more than a slight inflammation of the parts, even were there any. But as before stated, when the agent reaches the seat of trouble, the indications will be unmistakable by the manifested, though not severe, sensations of the patient.

If there is a fistula in the gum, and the carvacrol is forced through, *via* the root-canal, it, being less caustic and escharotic than creasote, does not, like it, leave a white track; and therefore creasote is, in this respect, different, as showing more distinctly its appearance on the outside.

While carvacrol makes its presence in the abscess immediately felt by the patient, who communicates the intelligence, creasote *must*, or it is, at least, more necessary that it *should*, appear through the fistula, that we may know that it has performed its work; and so it is if the elixir of vitriol is employed.

As it is at once apparent when carvacrol reaches the abscess, though there may be no fistula through which it may appear, there would not be so *much* danger from over-medication by the injection of too large a quantity, as there might be with creasote, owing to its being less an irritant than the latter, or in other words, from the fact that it can be employed more freely, with not so much danger of causing inflammation and swelling. But though there is not so *much* danger of over-medication as with creasote, there *may* be *danger*, nevertheless; and notwithstanding there might not, in the majority of cases, be any trouble from this source, recent experience has taught that it should be employed judiciously, particularly in cases of scrofulous diathesis.

We cannot yet say that it would be sufficiently powerful for all

uncomplicated *chronic* cases of alveolar abscess, though such seems to be the fact, so far as experience indicates.

In a case of seventeen years' standing, in the mouth of a married lady, aged about forty, with a fistula opening, and discharging, on the palatine surface, and leading from the root of the right superior lateral incisor, the destruction of bone was somewhat extensive, so that the bare root could be felt with an instrument. The cavity in the alveolus was syringed and filled with the carvacrol, but as this was the first trial of this agent in this direction, it was followed by the elixir of vitriol, lest there might be any broken down alveolus, and for the effect it might have in dissolving it. The fistula was speedily closed without further treatment, and the tooth received a root and crown filling without exciting the slightest inflammation. Here it would be impossible to determine with certainty which agent, or whether both, effected the cure.

But in a case, the report of which follows, carvacrol alone was employed.

The tooth was a perfectly sound but abscessed left superior cuspidatus, in the mouth of a young married woman.

It was a chronic abscess of seven years' standing — the death of the tooth having been consequent, it is supposed, on the loss of alveolus, from involvement with an abscessed lateral incisor root.

On opening the pulp cavity, it was found full of very offensive matter, a dead pulp being removed entire. Two applications of the carvacrol were sufficient to cause the healing of the fistula in the gum, and the parts to assume a healthy appearance. The first was made through the fistula, as the attempt to force the medicine into the abscess through the apical foramen was a failure. This did not entirely check the discharge of pus. A period of twenty days having elapsed, the attempt to inject the carvacrol into the abscess, *via* the root canal, was successful, by the employment of a broach wound with floss silk — the entrance of the agent being immediately followed by a burning sensation. Following the operation, in each case, the root was temporarily filled with floss silk saturated with the medicine, and the crown cavity with the oxychloride of zinc.

No inflammation followed the medication. In two months after the second and last treatment, the patient called with the parts presenting a healthy appearance. This was the third case of alveolar

abscess in which carvacrol was the remedial agent. The second was successfully treated with a much stronger preparation, though of a similar nature, perhaps. This, a small percentage of which was obtained by distillation after all the carvacrol had passed over, we have as yet been able to recover only in one instance, for the reason that it is not usually present, and probably *never* is, excepting in very old material. Its specific gravity, too, is much greater than that of carvacrol proper, the boiling point higher, and its properties — some of them at least — much more pronounced. An analysis may reveal that it is a "new product," hitherto undiscovered.

A German girl, with the right superior lateral incisor aching, and sore to the touch, called for treatment. There was no cavity in the tooth, and no fistula in the gum, though it had previously swollen. Access was made to the pulp cavity (which was found to be full of pus), on and through the palatine surface, by means of the incomparable burring engine. The root was cleansed. The "new product" was pumped through the foramen of the root, into the abscess, by means of a broach wound with silk, as before. It produced a *severe* burning sensation, indicating *unmistakably* that it had reached the seat of trouble. Floss silk was then saturated therewith, with which the root was temporarily filled, the crown cavity being sealed up with oxychloride of zinc. The pain produced soon partially abated, but continued with less severity for two and one half hours. Some slight inflammation and swelling was excited, which soon subsided. In five days thereafter, the tooth being slightly sore to the touch, the treatment was repeated with the production of still less inflammation than before. In a week following the last application, the tooth was entirely free from soreness, with no inflammatory symptoms, and the parts looking healthy.

But these examples will suffice, though others might be given.

The solvent properties of carvacrol are somewhat pronounced. It dissolves gutta percha, or Hill's Stopping, and the ordinary red unvulcanized rubber, very readily, which is as far as experiment has been carried in this direction.

Therefore if the root-filling of silk or cotton is saturated with this agent, the oxychloride of zinc is the best for a retaining plug; that is, a temporary crown filling over all.

Gutta percha, or Hill's Stopping, will be rapidly softened, excepting care be taken to wipe out the excess of carvacrol.

Though the impressions embodied in the foregoing remarks, concerning the action, properties, and manner of use of carvacrol, may be somewhat modified by future and more enlarged experience, it is believed that they will be found to be, in the main, correct.

DISCUSSIONS.

Dr. ATKINSON: I want to make a few remarks in regard to the glycerole of thymol. It has been objected that it produces pain. Now the glycerine being made up of carbon, hydrogen, and oxygen, has a strong affinity for water; and by virtue of this bond it takes the water from the tissues and thus produces the shock complained of.

The objection to using pure thymol, which produces no shock, is that it has to be brought to a high temperature for direct application, and moreover, it is a wasteful method of use. I indorse the use of carvacrol — in fact, of all the carbol series — for they act as disinfectants.

In reference to molecules again, there are two forms of atoms in a molecule of water, and one is a monad and the other a diad — these are the measure of the bonds that unite the two gases to make a liquid, under the potentiality of affinity, when made active by a current of electrism passing within the sphere of influence to marry them in accordance with full satisfaction of their bonds of affinity. My first love was creasote; then came thymol, and then carvacrol. In regard to pepsin, I would say *it* does not dissolve anything. It stands as an embodiment of force — an active principle, enabling the water to dissolve and discharge the deteriorated albumen and albumenoid compounds that are capable of putrefaction if no disinfecting agent be present.

The method of using the pepsin I indorse. At times I also use dilute phosphoric acid along with it.

Dr. TAFT: In regard to carvacrol, I have been experimenting

with it for some time, and in many cases have been exceedingly pleased with it, though it is not alike efficacious in all cases. The subject of therapeutics is of very great importance — one in regard to which there is perhaps as little knowledge among the profession as any other. Very much of the practice of Dentistry partakes of the practice of Medicine. How many men confine themselves strictly to mere manipulation? Few enter on the subject of treatment as they ought.

He concluded by exhibiting to the Association a convenient form of medicinal preparations, denominated Divided Medicines. The medicines are mixed with gelatin, which serves as a vehicle; it is rolled out into squares and crossed so as to indicate the quantity of medicine contained in the limits prescribed. He recommended this for dentists' use, being in a form for administration at once. Medicines thus prepared render the writing formulas and prescriptions unnecessary.

Dr. CHASE said that he had been in the constant habit of using pepsin since last January. That he thinks it very useful in dissolving away the dead pulp in root canals.

Creasote or alcohol will destroy the action of the pepsin, and therefore wax and cotton should be used as a plug to retain the pepsin for the two or three days that it is desirable to keep it in the tooth. Sometimes makes a second application.

Dr. REHWINKEL thought the profession greatly needed a handbook of Materia Medica. He moved that the Committee on Therapeutics be instructed to investigate the action and properties of carbolic acid, creasote, thymol, and carvacrol, and indicate the symptoms or peculiar conditions under which one of these agents was preferable to the others.

Dr. ATKINSON: There is a new invention by Dr. J. B. Wingate, of Carbondale, Pa., called "Depurator," for the treatment of incipient abscess and other local inflammations, which I like very much. It consists of little glass cups of different forms to apply to any part of the mouth or flesh, by which you may operate either dry or wet cupping very neatly and effectually. An air-pump is used to exhaust the air, which it does by a few strokes. It affords prompt relief in local congestions and is perfectly under control. Alveolar abscesses in the sockets of pulpless teeth are readily

aborted by this treatment. It is much more convenient and sure than the use of even the best leeches.

Dr. STELLWAGEN said that in many cases he had gone back to the simple alcohol, and found that it would answer. It was a good bleacher and cleanser, and is frequently as good as the other preparations which had been suggested: the tinctures often acting only as perfumed alcohol.

ACTION

OF

ANÆSTHETIC AGENTS.

By M. H. WEBB, a Member of the Committee on Dental Chemistry.

IN the absence of a report from the Chairman of the Committee on Dental Chemistry, I present this paper, which is submitted only as collateral to that report, and may serve to open discussion upon points more directly related to the subject under consideration. The effect of chemical combination in changing the properties, action and tests of elements cannot be too fully appreciated, and I would especially direct your attention to that part of the paper which touches upon this in the production of anæsthetic effects upon the system.

Certain vapors, as those of ether and chloroform, or a gas, as protoxide of nitrogen, when inhaled, produce a certain result which has been termed anæsthesia — a derivative of the Greek *anaisthaesia* (from *α*, without, and *αισθανομαι*, to perceive, or be senible of): anæsthesia, therefore, signifies a suspension of sensation. The action of anæsthetic agents has been said to be "physiological," but as they suspend, to a greater or less degree, functional activity, it would be more in accordance with the true condition of the system, when anæsthetized, to call such action semi-physiological, or tending to pathological. During the administration of an anæsthetic agent the operator can learn that there is a tingling sensation in the fingers and toes, and at the same time, as the influence of the agent reaches the cerebrum, will find that the olfactory ganglia, or bulbs of the olfactory nerves, situated anteriorly and at the base of the cerebrum, become affected — the patient losing the sense of smell. The tubercula-

quadrigemina — the ganglionic centers of the optic nerves — afterward become affected, when a dilation of the pupil is noticed. At a distance back, and below the fourth ventricle, is the bulb of the auditory nerve; and when anæsthesia is carried beyond this and the origin of the trifacial nerve, and the sound of the voice is unheard, one can perform any minor operation, but for those of a greater extent the effect should be carried still further. Too many operate before the functions of the cerebellum and pons-varolii are suspended, at which time more pain will be experienced than if an anæsthetic had not been administered. Many theories have been advanced in reference to the action of anæsthetic agents; Dr. Sansom, in his work on chloroform, stating that they act by "altering the physical character and physical properties of the blood," while Dr. Richardson and others contend that they act "directly upon the nervous system." To sustain this latter theory animals have been submitted to an atmosphere containing a deficiency and an excess of oxygen, the result apparently being in favor of said theory — the animals not becoming anæsthetized. The gases composing that atmosphere were mixed — the nitrogen and oxygen were not combined, but simply lay in juxtaposition, — for from inhaling a mixture of the gases — equivalents, as in nitrous oxide — we fail to observe any effect but that of hyper-oxygenation; whereas, when these gases are combined, as in the gas resulting from the decomposition of nitrate of ammonia, a hypo-oxygenation follows, and we have anæsthesia. Were nitrous oxide to become decomposed and the oxygen disengaged, a portion of which to be appropriated by the blood, the effect would evidently be similar to a simple admixture of the gases. In further support of the theory that anæsthetics act directly upon the nervous system, it has been stated that there is not sufficient time for the action of such agents through the arterial system. The circulation of the blood is completed in about thirty seconds, and anæsthesia, with chloroform as the agent, can be effected in about the same time, evidently proving that anæsthetics have time to act by causing deficient oxygenation of the blood. By atmospheric pressure, brought into play by contraction of the diaphragm and muscles of the chest, the trachea and the larger of the bronchial tubes are filled, and the air is then diffused throughout all the ultimate cells, thus being brought to the blood as it passes through

the pulmonary capillaries. The air-cells are supplied by first contracting and driving off the carbonic acid and vapor, furnished them by the venous blood through the plasma, and then inviting, by their relaxed condition, the advance of oxygen from the atmosphere which passes through the wall of the cell, the wall of the capillary, and to the blood disc, all in about two seconds. When the blood is deprived of its oxygen by the inhalation of an anæsthetic agent, the venous blood does not pass as such to the arteries, because the absence of oxygen does not prevent the carbonic acid being transmitted through the plasmatic tissue to the air-cells, and then driven off by their contraction, except when the blood is surcharged with it, as when an undue supply of oxygen is inhaled — a greater quantity of carbonic acid gas being thereby eliminated — when some may enter the arteries in addition to that normally present; however, when a gas or vapor is inhaled, which, to a great extent, deprives the blood of oxygen, the arterial partakes of the color of venous blood. As the introduction of oxygen into the red corpuscle causes the coloring property — the hematoglobulin, or crourine, — to assume an arterial or florid hue, so in the deprivation of oxygen it remains livid, as seen when the cargo of oxygen is conveyed to the tissues, and the blood enters its venous channel to transport the effete carbon to the lungs, where it is discharged into the broad ethereal expanse.

A province of the blood, then, is to convey oxygen throughout the system, vitalizing and revitalizing every part, and to appropriate, in its recurrent venous circuit, the carbonic acid and vapor resulting from a waste of tissue. As we come to the consideration of the ascending scale of animal existence, from the lower types to man, we find that, like the vasculatory, the nervous system in the lower animals is simple, yet in man it attains an immensity corresponding to his elevated position.

For twenty centuries numerous theories have been in contemplation in reference to this wonderful system; yet, far out into the dim distance of future ages, there doubtless will be revealed new truths, which will emblazon the countless pages yet to be written on this, the grandest subject of physiology. Physiology teaches that there are centripetal, or sensory, and centrifugal, or motor, nerves — the centripetal being, as it were, a labyrinth of cords, like unto the iron nerves spread over a continent, which transmit,

with the rapidity of lightning, to a nation's capital or metropolis, impressions made upon them; while the centrifugal consist of those nerve fibers which ramify throughout every part, and convey that which is communicated to them to its destination. The arteries, whilst lying in juxtaposition to the nerves throughout the system, transmit oxygen to them, and thus maintain their power — the functional activity of the brain and the whole nervous system depending upon a copious supply of arterial blood — blood containing oxygen. Take away this vital principle — let there be inhaled a gas or vapor that will interfere with the oxygenation of the blood, — and we find the whole system affected in consequence, a loss of power is experienced, and, if such inhalations be continued, we have insensibility. Is not this anæsthesia? Those organs presided over by the involuntary and semi-voluntary nerves — the heart and lungs — not becoming affected except where anæsthesia is carried too far, proves, however, that the whole nervous system is not acted upon by the agent, and that before this can be accomplished the effect must be transmitted to the brain mainly through the carotid and vertebral arteries, which carry to that organ about one fifth of the blood in circulation. From the blood pursuing its way onward through the arterial system without its due supply of oxygen, in consequence of the inhalation of an anæsthetic agent, the seat of intelligence (the cerebrum), that of co-ordination of motion (the cerebellum), and the pons-varolii, become affected, and if the medulla oblongata is too greatly influenced, the result will prove fatal. Anæsthesia, then, is the suspension of cerebral function for a time — so far, at least, as the capability of the brain to receive impressions is concerned; and, indeed, is indicative of a general loss of power on the part of the sensorial system, and, when the cerebellum and pons-varolii are affected, an inability to communicate with other parts of the system through the motor nerves. When the influence of the agent has been carried even this far, motion can be communicated by passing a rapid intermittent induction current from the medulla oblongata to the lower extremities, the battery acting as an outer brain, supplying power without intelligence. Dr. Richardson, of England, has demonstrated this by experiments on the lower animals.

When anæsthesia is carried to that extent where the functions

of the cerebrum, cerebellum and pons-varolii are suspended — and but a slight advance would involve the link that binds the patient to existence — the thought should arise in the mind of the operator that before him reclines one whose life is in his hands, and that, were he to allow the influence of the anæsthetic agent so to involve the medulla oblongata as to paralize the whole ganglionic portion of the pneumogastric nerve, the soul might take its flight from its earthy casket and be wafted into eternity. It behooves us, then, to be cautious — to be faithful sentinels; and with a mind well prepared and quick to comprehend, and a hand bold to execute, be ready to wrest all from such impending fate, and thus confer ecstatic joy upon friends of the one who is called once more into all the loveliness of a reviving hope and reanimated nature.

DISCUSSIONS.

Dr. Atkinson: Though the paper just read could not properly come under the head of a report on Dental Chemistry, he considered it indicative of fresh thought. "Privity of oxygen" was the true cause of anæsthesia. If the subject of chemistry, directly, should be discussed by the Association, he had something to say on crystallography; and something which might throw light upon the subject of calcification and absorption of the teeth.

Dr. Buckingham: That all anæsthesia is the result of the want of oxygen is an old theory. Were this true, we might give hydrogen, nitrogen, or any other gas which contains no oxygen. Anæsthetics pass through the blood, and, being absorbed, so act upon some of the functions of the body as to deprive them of sensation and the power to act; he did not know how.

Dr. Atkinson, on being asked, if his theory was a correct one, how he would account for the anæsthetic effect of mesmerism, said: Mesmerism afforded the best evidence that could be adduced in support of that theory. In order to come under the mesmeric influence, the mind must be kept fixed and at rest; respiration and inspiration are gradually arrested, and a general cessation of feeling

and sense ensues. Awaken the mind, restore the function of respiration and inspiration, and a general restoration soon takes place.

Dr. SUMMERS: I do not believe it is the deprivation of oxygen that produces anæsthesia; in fact, I know it is not. If you take oxygen from the system you do not produce anæsthesia. Alcohol has been suggested here as an agent for cleansing root canals. We have no better disinfecting agent than pure alcohol. I use it in the laboratory for this purpose. For preserving meat from putrefaction and maggots, it is the best thing I have found. With reference to the action of acids and alkalies upon the teeth, in the mouth, I am still of the opinion that the alkalies are the most destructive agents. They act upon the pabulum, taking away the base. The presence of acids does not prove that they are the cause of decay. There is nothing so destructive to animal life as the alkalies. Hydrochloric acid acts slowly upon the teeth, but we do not carry enough of this acid in the mouth to destroy teeth.

Dr. BUCKINGHAM: Alkalies may destroy the teeth, perhaps, by overcoming vital force, and by causing the elimination of an acid destructive to the teeth. Alkalies will not destroy a tooth if immersed in them.

Dr. SUMMERS: These alkalies enter the blood-vessels, thus coming directly in contact with the tooth substance through the local circulation, and so destroy the pabulum of which the tooth is formed. [In reply to the question, "Why does it not, then, act upon the bones and other tissues,"] he said: It goes into the blood at a point immediately surrounding the teeth, through the corpuscles, and destroys the pabulum.

Dr. TAFT presumed that any agent entering into the general circulation would affect the general system; but the teeth did not obtain their supply of nourishment from the corpuscles immediately surrounding them.

Dr. ATKINSON thought the truth would be found in the mean between the two theories. Alkalies entered the tooth at the distal end of the tubuli and interglobular spaces, being attracted by the pond of supply.

Dr. OSMOND had observed the evil effects of alkalies upon the teeth. By constant use of baking-powders and soda, the phosphates are eliminated and the pabulum destroyed. In tuberculosis

the phosphate of soda had been found of great service. The rationale of this treatment was to supply the waste of the phosphates. Baking-powders rob the system of the phosphates, and render the secretions acid, thus destroying the teeth. He had observed the deleterious effects of sozodont, and also of soap, upon the teeth. Softening at the margins of the gums would result, if their use was persisted in.

Dr. DOUGLASS mentioned the case of a patient who had suffered from a recession of the gums, on account of the use of long continued doses of bicarbonate, and iodide and bromide of potassium, which had been prescribed by her physician.

Dr. OSMOND recommended the application of nitrate of silver for the cure of the sensitive condition often found at the necks of the teeth. Two or three applications usually effect a cure. It will blacken them, but makes them very hard. To protect the surrounding parts in applying this remedy, he makes a small disc of paraffine and places a drop of the nitrate into it.

Dr. DOUGLASS said that after applying the nitrate of silver to sensitive dentine, or any other part of the mouth, and letting it remain a sufficient length of time, he applies common salt, either in solution or substance, which instantaneously converts the excess of nitrate into chloride (which is tasteless), and prevents its further action, but does not remove the discoloration.

Dr. BUCKINGHAM said a very convenient way to apply nitrate of silver was to use a silver wire which had been dipped in nitric acid, with this the remedy could be carried to any part desired very neatly.

Dr. HITCHCOCK: I do not care to discuss the subject of the relative effects of alkalies and acids upon the teeth; that was settled as long ago as 1843, by Dr. A. Westcott, and I would refer the gentleman who thinks alkalies are so injurious, to the result of these experiments. No one disputes the fact that alkalies act upon the organic portion of the dentine if the enamel is removed. When the dentine is covered with enamel, alkalies do not affect it. Something has been said about soap being detrimental to the teeth. I have a tooth which has been in a solution of fine castile soap for more than two years, and the enamel is, as far as I can see, as perfect and of as good color as when it was first placed in it. I have used nice soap, either alone or combined with

precipitated chalk, as a dentifrice, for more than thirteen years, and consider a combination of soap and chalk the best dentifrice one can use.

I have used nitrate of silver, as suggested in Tomes' "Dental Physiology," and obtain valuable results from it. We constantly meet with the first stages of caries at the necks of the teeth; perhaps there will be a little softening of the tissue, or there may be none. Sometimes it is a little discolored, but very sensitive. My plan is to apply, only to the sensitive spot, a solution of nitrate of silver. It causes no pain, but after a short time becomes dark, the softened dentine, for it is beyond the enamel, becomes hard, the sensitiveness disappears, and a filling is avoided for some time, and, perhaps, forever. Chloride of zinc is used for superior incisor teeth, and it will produce nearly the same effect, though the result is not so permanent.

Ladies often come under our care presenting extremely sensitive teeth, with caries at the necks, more especially of the lower teeth, molars and bicuspids. We feel almost that filling will be useless. Litmus paper is reddened by the saliva, either while the patient is in the chair, or some time during the day. I have been in the habit of ordering, in these cases, the use of bicarbonate of soda in teaspoonful or half-teaspoonful doses, two or three times a day, either just before or just after meals, continued for one or two weeks. I usually find the acid reaction of the saliva has disappeared, litmus paper is not changed; tumeric paper may even be slightly reddened, the cavities have lost their extremely sensitive condition, and filling can be performed with a better prospect of success. We should do what we can to keep the secretions of the mouth alkaline, or at least neutral. Until I feel that gold fillings will prove permanent, I use Hill's stopping.

Dr. STELLWAGEN said that he did not believe that alkalies, such as found in the mouth, had any deleterious effect upon the teeth. He fully understood the osmotic action referred to, an example of which was seen in the immediate effect produced upon the teeth by the introduction of acid or acrid substances. He referred to what had been said by himself, at Nashville, on this point, with regard to experiments made on his own children, by rubbing chalk around the teeth and putting lime-water in their milk, thus hardening the teeth.

Dr. HITCHCOCK — in answer to the question of Dr. Taft, as to what was the action of nitrate of silver when applied to the enamel or dentine — said: I presume it unites with the animal substance of the dentine, forming an albuminate of silver.

Dr. TAFT: My object in asking is to ascertain whether it is necessary to use nitrate of silver. It is the nitric acid that unites with the calcium oxide, leaving the silver oxide on the surface. The nitric acid itself will accomplish all that is desired, and discoloration of the dentine does not follow its use. It can be diluted as desired.

Dr. OSMOND: I have tried nitric acid, and find it produces sensitiveness. In the action of nitrate of silver, it is the silver oxide that unites with the albumen.

Dr. HUNTER: Alkalies, if I understand Dr. Summers, destroy the framework of the teeth, and allow them to break down. This is contrary to the recognized theory that the cause of decay is external and not internal. I have never known a case where I could see any evidence that the cause was internal.

Dr. REHWINKEL: If Dr. Summers' theory be correct, it is certainly very important that it be understood; for if the capillary system possesses the power of absorbing any agent and conveying it directly to any specific organ, we have a powerful adjunct in overcoming local disease.

Dr. BUCKINGHAM observed that the tooth did not get its nourishment from the external vessels surrounding it, but from the general circulation. He used alkalies — caustic potash, for instance — for obtunding sensitive dentine.

Dr. WHITNEY, of Honolulu, said: During the four or five years I was on the Sandwich Islands, I gathered some facts which seem to bear on the point at issue in the beginning of this discussion. Formerly all burials were made in caves, so that 10,000 skeletons to-day may be found in these caves. An accurate history kept by the people enabled me to determine exactly when fruits and acids were imported into the islands. I thought, now can I, knowing these things, determine anything definitely in regard to the effects of acids on the teeth? I went through the caves and examined the teeth of the oldest skeletons, before fruits were brought on the island, and I found that though not perfect, they were not nearly so much decayed as those of later

times. So marked was the difference that I could mark the time, when fruits were introduced, by the teeth of the skeletons. In those fed on fruits there was one in fifty decayed; in the older, one in one hundred.

Dr. FORBES: There is nothing more troublesome or annoying to the dentist than sensitive dentine. There are very few of us who can say to our patients — as Dr. Arthur says he does — "If you do not eat and drink as I direct, I will not treat your case." We have had alkalies, caustics and acids recommended to-day for obtunding sensibility. I have used alcohol and common chalk, and I find in its use all that has here been recommended; for it is well known that manufacturers put nitric acid in their whisky. This is my tooth powder [Laughter] — prepared chalk and alcohol. The more simple the injunctions to our patients, the more likely are they to be followed.

Dr. DOUGLASS spoke against the long-continued administration of large doses of alkalies as medicines, but more strenuously against the use of the mineral acids. He had seen fine sets of teeth ruined by the use of "sour drops" (which are a dilute form of nitric acid), and hundreds of elegant sets whose beauty was destroyed by the muriated tincture of iron.

DISCUSSIONS

ON

OPERATIVE DENTISTRY.

Dr. HITCHCOCK opened the discussion on this subject (there being no report) by presenting some models, on which he explained a case of irregularity which he had corrected by torsion. He said this practice was resorted to in England to a great extent. They would sometimes turn a tooth half the required distance at one sitting, and then, at another, to its proper position. He referred to Tomes and others as authority on this point.

Dr. JUDD called attention to the notched condition of the teeth, so often met with, and alluded to the views of Dr. Hutchinson on this subject, who regards this condition as a pathognomonic sign of syphilis. The speaker remarked that it was something entirely distinct from, and had nothing to do with the disease known as atrophy. He would like to hear an expression of the Association in regard to the views put forth by Dr. Hutchinson in regard to this condition, as a sign of syphilitic taint. The question was of great importance, and, he believed, had never been discussed by this body.

Dr. HITCHCOCK: This is a difficult matter for one in our specialty to determine, unless he has the confidence of the regular medical attendant of the family, or the oculist. Mr. Jonathan Hutchinson, of London, first stated that a peculiar deformity of the teeth was due to congenital syphilis. Other ophthalmic surgeons agree with him. What are the causes of this notched condition? Some believe it to be due to specific stomatitis occurring while the teeth are forming. An oculist informed me of a case in which a lady carried her daughter to him for the treatment of in-

terstitial keratitis. He noticed the notched teeth, these two conditions often going together as result of congenital syphilis, and asked the mother if the daughter had had any eruption upon the body during infancy. The next day he received a note from the father suggesting that he should cease his interrogations.

Dr. STELLWAGEN: In the wards of the Philadelphia Hospital, one of the largest eleemosynary institutions in the land, I examined the mouths of the children, with a view of satisfying myself on this point. The results were not confirmatory of Hutchinson's observations. I was so little encouraged by my examination, that I have not paid much attention to it since. Negative results, of course, do not prove the assertion is without foundation. I think I saw numbers whose parents were tainted.

Dr. HITCHCOCK: Had the parents had inflammation of the mouth? I think it is not claimed that the offspring of every person who has had syphilis, develops this notched condition, but when it does occur it is referable to syphilitic taint.

Dr. JUDD: Dr. Hutchinson was employed almost entirely in treating hereditary disease. He has not made many observations on healthy parents. Now can *we* find this notched condition where there is no hereditary taint? This is what we want to know, I think. If our attention is directed to it, we may determine this. If we can find one case of the sort we can state positively that it is not a pathognomonic sign. Hutchinson does not think that it will apply to the deciduous teeth.

Dr. STELLWAGEN: It is almost impossible to satisfy ourselves that there is no hereditary taint. I know some most sad cases of contamination of infants, carried by nurses to places where it was imparted to the lips of the little innocents by contact. The children are forever contaminated.

Dr. TAFT raised a point of order, that this was not the subject under discussion.

Dr. HERRIOTT: Some have experienced trouble in the use of burring engines, on account of the wearing out of the burs. I have heard it surmised that they lose their temper on account of the heat developed by the friction. I was surprised to learn that anyone should use the bur, in such a way as to destroy its temper by heat. It is a great mistake to apply the bur constantly, while preparing the cavity and making retaining pits, until it becomes

heated. It should be used, intermittingly, not using it long enough to become heated, or to heat the tooth.

Dr. CARROLL: The small burs are either lacking in temper or in the quality of steel of which they are made, for after the second or third time they are used they are almost worthless. I cannot think this is the result of rapid revolution, for I could use the old finger-burs a month, imparting great velocity to them, before they became badly worn.

Dr. MCDONNELD: I have met with difficulty on this point myself, and am satisfied that it is due to the velocity with which they are turned. They should be kept surrounded with moisture. I have come to the conclusion that it is heat which causes the trouble. A small bur would lose its temper where a large one would not. I have adopted Smith's drop-stopper to keep the surface wet.

Dr. EAMES: I noticed in an English journal that the dentists in London had met with the same difficulty. They had made arrangements for overcoming it by having a tank with a flexible tube attached, so as to conduct water to the bur, and the flow was regulated by a thumb-screw.

Dr. TAFT: The common rubber-ball syringe answers well for this purpose. I desire to call attention to the cleansing and polishing of teeth. We frequently find deposits on the teeth, as green stains, in the mouths of young persons — especially on the anterior surface of the superior teeth — also roughness and abrasion. The ordinary method of polishing involves a great deal of labor. I have been using Dr. Baxter's little cones of Arkansas stone for this purpose. I apply them with Dr. Morrison's engine, and they clear away all the roughness, and polish the teeth completely. Nothing else is required, as they leave a polish nearly as perfect as that of the natural enamel. [Various forms of the stone were here exhibited.]

Dr. HERRIOTT: I think dentists will find no trouble from the heating of burs, if they use the air-syringe. Morrison's engine is a fine thing, but we need one that will not restrict the freedom of our bodies. The discs furnished us are exceedingly frail, and great care is needed in using them, both for the safety of the burs and of the teeth.

Dr. KNAPP: It was suggested at Niagara that sensitive dentine

had better be operated on when dry. I apply the rubber dam before removing the loose material. All agents are more effective if applied when the cavity is dry. You need not operate so rapidly as to heat the bur, but you had better not wet the cavity. A young lady came to my office, crying, in dread of the operation. I adjusted the rubber dam, removed the loose material from the cavity, then applied carbolic acid. The operation was a little painful at first, but she got through very comfortably, in view of what she had expected. You had better pay for more burs than to wet the cavity while excavating.

[At this point the discussions were interrupted by the President's announcing that a gold medal had been forwarded to him by the California State Dental Association, with the request that this Association present it to Dr. S. C. Barnum, in behalf of that Society. He accordingly called upon Dr. C. C. Knowles, of San Francisco, to make the presentation, which was as follows:]

Mr. President and Gentlemen — In the divine order and fitness of things, it seems eminently proper that I, as the representative of the "California State Dental Association," should be called upon to present this gift to the gentleman for whom it was designed, and I thank you, sir, for the honor, but regret that this request was not made in time to allow me to choose words more fitting to the occasion, and better expressing the sentiments of the donors.

The history of this gift had its origin in a discussion of the VULCANITE RUBBER question, and the attitude of its owners and their agents in their illiberal policy, as contrasted with the value of the RUBBER DAM, and the generosity which dedicated it to the profession.

In 1872 a committee was appointed to take the matter in hand and report some suitable method of expression, and this is the result.

Dr. Barnum, allow me, in the name of the "California Dental Association," to present you this bauble as a small token of the esteem and respect in which we hold you — not so much upon personal considerations as in recognition of that genius which invents, and that generosity which confers benefactions on our kind. You are mostly indebted for the shape which this expression of our appreciation has assumed, to the persistency of Dr. Dennis, Chairman of the Committee, and for the beautiful design, to Dr. Dutch. Take it, sir, and may that spirit which erects monuments of stone to the posthumous memory of earth's benefactors never deny you bread while living.

Dr. BARNUM: *Mr. President and Gentlemen* — This is indeed a beautiful testimonial. God knows I am truly grateful for the kind appreciation it evinces. I like it, not for its intrinsic value, so much as because it tells me that the value of my little effort has been generously recognized by the donors. I would that I had words to properly express myself. Gentlemen of the

American Dental Association, you have all treated me kindly, and I thank you. If I could do more I would cheerfully do it. I have never regretted giving freely to the profession what I might have made lucrative to myself. I don't ask for money — that I can work for — but this testimonial I look upon with great satisfaction. I shall take occasion to return my thanks to the Society from which it came, by letter, when I can write in chosen words Gentlemen, again I thank you all.

Dr. MORGAN, in reference to the Arkansas-stone points, said: Dr. Hamlin and myself tested these points in connection with pumice, and other means in common use for removing the green stains on children's teeth, and polishing the surfaces, and we found that these points did the work much more rapidly, and left a more perfect and lasting surface. While teeth remained clean and smooth, after being polished with the Arkansas stone, others, in the same mouth, which had received as good a surface as we were capable of giving them by other means, would become coated again.

Dr. FORBES asked Dr. Knapp, if the absence of pain, in excavating a cavity of decay, after the application of the rubber dam, was not due to the counter irritation produced by the appliances.

Dr. KNAPP: I think not.

Dr. CHUPEIN: I have had cases in which it was impossible to touch the dentine with an instrument, owing to its sensitiveness, when, after adjusting the dam, I was able to excavate without difficulty and with little pain.

Dr. CARROLL: I fill no teeth without the aid of the rubber dam. It facilitates all the preparatory operations, as well as that of filling.

Dr. MCDONNELD: I have been using it for some years with success. But my previous experience has taught me that I can fill many cavities, where the dentine is not sensitive, without resorting to it. It is the height of folly to torture a patient for nothing. In simple cavities I would think its application smacks of the inquisition.

Dr. JUDD: When the rubber dam was first introduced, its application was attended with a good deal of difficulty. Dr. Barnum had given us a clamp, but it failed to meet all cases. Other means were from time to time suggested for holding the dam in place, and yet there were cases frequently met with where all these failed.

To meet some of these cases, Dr. Eames and myself had a clamp constructed, about four years ago, which is identical with the Allen clamp now in use, except it was made round, instead of being flattened. This is undoubtedly one of the best forms of clamp we have. I apprehend that some fail in its use for the want of a full understanding of its application. The clamp should be placed on the tooth first, then pass the dam over the clamp, and stretch it down over the tooth; pass a ligature between the teeth in front of the clamp, carry it round behind the clamp, and tie with a single knot on the buccal or mesial surface of the tooth.

Dr. TAFT: I saw the first samples of this appliance in New York, two years ago or more. It was made by Dr. Delos Palmer. His is better than the Allen clamp. There are cases in which annealed copper wire can be used with benefit — when the tooth is so conical that the clamp will slip off.

Dr. STELLWAGEN called attention to Dr. Jack's use of gold-beater's skin for laying over exposed pulps, before applying oxychloride of zinc. He stated, further, that with keen instruments the most sensitive dentine could generally be excavated with comparatively little pain. He used Dr. Palmer's fine instruments, and he had not believed, before trying them, that it was possible to get so keen an edge to stand as these do, when cutting enamel or dentine.

REPORT

ON

DENTAL HISTOLOGY

AND

MICROSCOPY.

BY THOMAS B. HITCHCOCK, CHAIRMAN OF THE COMMITTEE.

THE facts shown by Kölliker, in regard to the development of the teeth of ruminants, were shown by Waldeyer, as early as 1865, to be true also with reference to the development of the human teeth. They proved the observations of Arnold and Goodsir in regard to the teeth papillæ rising from an open dental groove to be incorrect.

The first indication toward the formation of a tooth is seen in a fold of the oral epithelium, which projects into the jaw, and, expanding, gradually takes the shape of the enamel cap of the tooth. The fold of epithelium is doubled upon itself, and it is the inner layer, internal epithelium, in which the enamel cells are developed. Shortly after the dipping down of the epithelium, and before it has expanded, there occurs a proliferation of cells just below, which under a low power of the microscope presents a darker appearance. This is the first rudiment of the dental germ or pulp. As development proceeds, this appearance becomes more marked, and the tissue assumes the shape of the dentine of the tooth which it represents. (Plates I. and II.)

The oral epithelium covers the surface of the dentinal germ, the space between the folds being filled with cells. The cells of the internal epithelium, next the dentinal pulp, become lengthened, are supplied with numerous nuclei, and finally assume the shape of the well-known cells of the enamel organ. (Plates III. and IV.)

The cells forming the dentinal germ or pulp, which at first were irregularly situated in their blastema, have become nearest the surface larger, and lengthened; have one or more nuclei, and after dentification has commenced, present the prolongations extending into the formed dentine, which we call dentinal fibrils. (Plate V.)

The cells or odontoblasts have, beside this process, to which Waldeyer has given the name of dentinal process, others, which he calls the pulp process and the lateral process, and which extend inwards, toward the center of the pulp, and laterally, communicating with other odontoblasts and reparative cells. Sometimes there are as many as six of these processes from a single odontoblast.

Observers are not agreed with reference to the termination of the dentinal tubes.

Wedl is inclined to think that they form by their anastomoses an inclosed system. The line of junction of the enamel and dentine is generally well marked, the dentinal tubes not extending into the enamel. Mr. J. Tomes, however, says some of the tubes pass across the line of junction into the enamel. Kölliker holds the same opinion, as also does Mr. C. S. Tomes.

Hertz and Waldeyer, however, inasmuch as they have been unable to verify these observations, differ from them, the latter saying a direct passage of the dentinal tubes into the enamel does not occur.

Examination of Plate VI. seems to prove that at times the dentinal tubes do penetrate the enamel, and that to a considerable depth. Physiologically, may not this account for the extreme sensitiveness which we sometimes find in the enamel while preparing cavities for filling?

With reference to the ultimate distribution of the nerves of the pulp, no new investigations have been recorded during the past year. The investigations of Dr. F. Boll in 1868, who was able, in the teeth of rabbits, to trace certain fine pale fibers, which were side by side with the dentinal fibers, and which he therefore believed entered the dentinal tubes, till he found them continuous with medullated nerve fibers, have been verified by others, and are received by many histologists.

Czermack first described the interglobular spaces. In examining for them Mr. C. S. Tomes tells us that they will be much

more readily seen if the teeth from which sections are cut have been first boiled in wax. They are found in nearly all teeth, and are not confined to the teeth of man. Mr. C. S. Tomes says they sometimes are obliterated by undergoing calcification, when the appearance described as "areolar dentine" is seen. (Plate VII.)

Waldeyer says they "are the result of a somewhat irregular process of dentification."

Prof. Wedl holds the same opinion. The latter states also, that sometimes in the teeth of elderly persons there is seen an increase in the number and size of the interglobular spaces, that they are often filled with amorphous calcareous salts, and that they are occasioned by interstitial absorption of the dentine.

The publication of English editions of Wedl's "Pathology of the Teeth," and Leber and Rottenstein on "Dental Caries," and a second edition of Tomes' "Dental Surgery" during the past year, has furnished us with several new observations in regard to the theory of dental caries. These are based upon the microscopical appearances presented as the result in many experiments, not only upon living teeth, but upon reinserted human teeth and teeth made from ivory.

Mr. J. Tomes and Dr. E. Magitot supposed the translucent zone of dentine in advance of caries was the result of a vital process, a consolidation of the dentinal tubuli, whereby the tissue was rendered more dense, and therefore less readily acted upon by the agents producing caries. It has, however, been shown by Leber and Rottenstein that this change occurs in human teeth which have been inserted as artificial teeth, and that the same appearances as regards the translucent zone, thickening and swelling of the tubes and fibrils, and discoloration, are found, as in caries of natural living teeth; moreover, these authors found almost precisely the same changes occurring in teeth made from hippopotamus ivory. They attribute the translucency to a chemical solution of the calcareous salts, which near the termination of the tubes is washed out; deeper in, however, and in contact with the alkaline fluids of the tubes, the salts are precipitated as calcareous grains. The thickening and swelling of the tubes and fibrils is due to the decalcification of the tube walls, and to the presence of the fungus growth "leptothrix buccalis."

This fungus, which is plentifully found in tartar and about the

necks of the teeth, is an active agent in the decay of the teeth. In fact, Leber and Rottenstein are of the opinion that after the enamel is penetrated by acids, or by mechanical injury, the fungus penetrates the dentinal tubuli, where it rapidly proliferates, destroys the fibrils and enlarges the tubes. They claim that after a lodgment upon the dentine is effected, even where it is not previously softened by acids, leptothrix rapidly destroys the tissue. Prof. Wedl, on the other hand, while admitting that leptothrix hastens the destruction of the dentine, considers the action of acids the more active cause, leptothrix not attacking any portion of the dentine until it is first softened by caries and deprived of life.

The appearance of leptothrix is very well shown by Leber and Rottenstein and by Wedl. On the surface it resembles short, straight filaments. Mr. J. Tomes, in 1848, in his "Dental Physiology and Surgery," speaks of the presence of fungus growths in caries of the teeth, and describes one as "consisting of straight, stiff fibers or threads, so small that the structure cannot be seen. * * * They look, with the lower powers of the microscope, much as ordinary mould does to the naked eye." This answers very well as a description of *leptothrix filaments*. These filaments are seldom found in the dentinal tubuli; here the fungus presents a granular appearance, and is called *leptothrix matrix — elements* or *grains*. Softened dentine will be found full of these grains, which can readily be distinguished under the microscope. Leber and Rottenstein have also shown that the action of a dilute acid and iodine upon leptothrix gives a violent reaction.

The leading observers, with perhaps the exception of Neuman, Hertz, and Magitot, who ascribed the changes in advance of decay, in the dentinal tubuli, to a vital process, have accepted chemical action in connection with leptothrix as sufficient to produce these changes. Tomes, in the last edition of his "Surgery," says: "Inasmuch as no characteristic appearances can be found to distinguish caries as occurring in living from that attacking dead teeth, it seems that the hypothesis of vital action in any way modifying the disease must be abandoned in toto."

Still there are vital changes, an increased activity of the odontoblasts, occurring in teeth which are the subject of caries or other irritating causes, which is manifested by the formation of secondary dentine, which in many cases is so formed as to protect the pulp

from invasion by the disease. The new formations are readily distinguished under the microscope. (Plate VIII.) They are not necessarily adherent to the walls of the pulp cavity, but often occur as small roundish granules in the pulp tissue. Sometimes they present a series of laminations about a common center. They are well described by Wedl.

Several interesting cases of repair of fractures of the teeth are described by Wedl, and plates given, showing the nature of the tissue of repair. He shows this to be composed almost entirely of dentine and osteo-dentine, developed from the tooth pulp; the part taken by the cement being only secondary.

Of the manner in which teeth of replantation become firm, Mr. A. Coleman, in a paper read before the Odontological Society of Great Britain, in 1870, states that examination of a superior molar which had been extracted and replaced, and was again removed at the end of thirty days, showed a dense fibro-cellular tissue, which was adherent to the dentine, and apparently projected into it. The dentine in the immediate vicinity of this new tissue seemed to have lost its distinctive character. Alluding to the tissue, he says: "Appearances seemed to point to its belonging more to the tooth than to the surrounding structures," but adds, "it seems more easy to suppose that it had originated from the periosteum of the socket, and had become, by absorption of the tooth and a dovetailing into its substance, firmly attached to it, although all appearance of such attachment was lost." Mr. Coleman, and also Prof. Wedl, refer to the experiment of Dr. Mitscherlich, who removed an incisor tooth from a dog's skull and placed it in the alveolus of a living dog.* After an interval of six weeks the dog was killed and the carotids injected. Examination of the tooth showed it to be firmly attached to its socket. He found that new formations of osseous tissue had grown into the cavities and depressions on the root of the tooth. He believed the new growth was developed from the lining membrane of the socket, which first caused absorption of portions of the root, and having projected itself into the cavities thus made, it became ossified. A section of a living tooth which was replanted, became firm, and was worn four years, showed, under the microscope, a new formation of cementum over the original. From this we would infer that, under certain conditions, new growths from the membrane of the root also may be the

* This was transplantation of a dead tooth, and should be distinguished from replantation.

means of fastening teeth of replantation. (Plate IX.) The new tissue, however, is more liable to absorption, causing loosening and loss of the replanted tooth, which we know is sooner or later the usual result.

The nature of the membrane, which Nasmyth discovered could be raised, by the use of an acid, from the crowns of unworn teeth, has been the subject of some discussion. The view held by Kölliker is, that after the complete calcification of the enamel cells, a secretion occurs which covers the entire surface and forms a protecting layer. Prof. Rolleston, in a paper read before the Odontological Society of Great Britain, 1871, ascribes its origin to the imperfectly calcified ends of the enamel cells, which become hardened or cornified. Waldeyer states it to be the cornified cells of the external epithelium of the enamel organ. He says that after treating it with a solution of nitrate of silver the epithelial cells may readily be seen. Mr. J. Tomes supposes it to be, not a product of the enamel, but of the cementum. He gives instances in which the cement extended over the enamel and into the fissures upon the crown. Prof. Wedl also supports this view, and gives an illustration of a molar tooth over which an enormous quantity of cement has grown. Mr. C. S. Tomes, in an article in the "Quarterly Journal of Microscopical Science," October, 1872, gives the result of his later investigations. He found the cement which fills the fissures of the enamel to be continuous with the *cuticula dentis*, and by the aid of an acid the whole could be removed, including the thicker portions containing the lacunal cells. (Plate VII.) As the membrane raised in this manner presented the same appearances upon the root of the tooth, and was continuous with it, he concluded it to be that thin layer of tissue which is in contact with the last formed cement, and which lies between the cement and the soft tissues. He says, "on the border of perfectly calcified structures there exists a thin stratum of tissue which presents marked differences from that which lies on either side of it; one of the manifestations of such difference being that great indestructibility which enables us to isolate it by the use of acids. Nasmyth's membrane appears to belong to this class of structures." Mr. Tomes' paper contains many strong arguments, and does more to settle the discussion in reference to the nature of Nasmyth's membrane than anything previously presented upon the subject.

DESCRIPTION OF PLATE I.

Longitudinal section of the jaw of a human embryo, showing tooth germ. The dentinal germ is seen in the shape of a papilla. The fold of epithelium is seen dipping down, the two layers separated over the papilla, forming the enamel germ, organ, which presents a darker appearance, bounded above by the external and below by the internal epithelium. In cutting the section an accidental space was formed between the dentinal and the enamel germs.

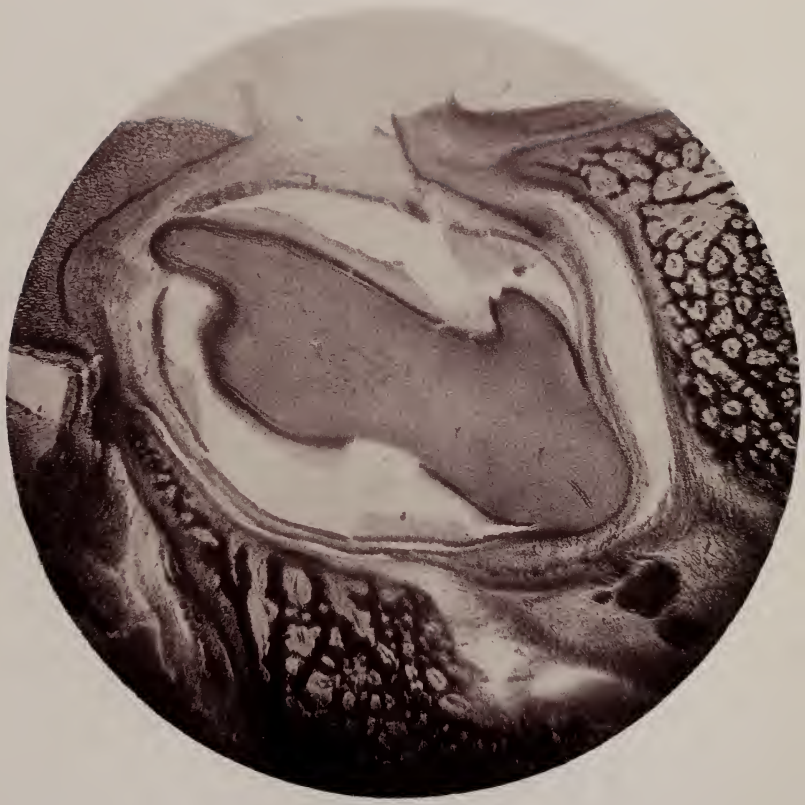
Magnified 100 diameters. ¼ inch objective.

1-100 of inch.

DESCRIPTION OF PLATE II.

Transverse section of the jaw of a fœtal calf, showing tooth germ. The dentinal germ has been distorted, and the enamel organ torn, in making the section. Some of the vessels may be seen in the dentinal germ; the dark line which bounds it is the developing odontoblasts internally, and the internal epithelium of the enamel organ externally. The lighter tissue beyond is the stellate reticular tissue, or, gelatinous layer, beyond which is the external epithelium; then comes the tooth sac of connective tissue, and the osseous trabeculæ of the alveolus.

Magnified 12 diameters. 1½ inch objective.



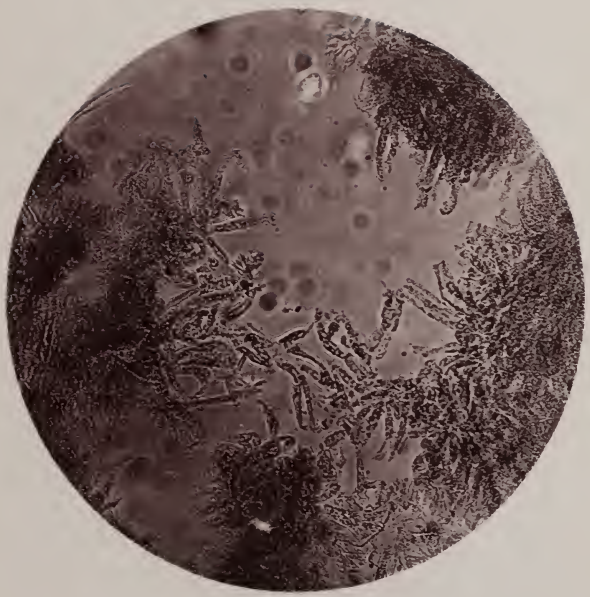
DESCRIPTION OF PLATE III.

A portion of the enamel organ from the tooth germ of a fœtal calf.

The enamel cells contain numerous nuclei.

Magnified 260 diameters. 1-10 inch objective.

1-100 of inch.

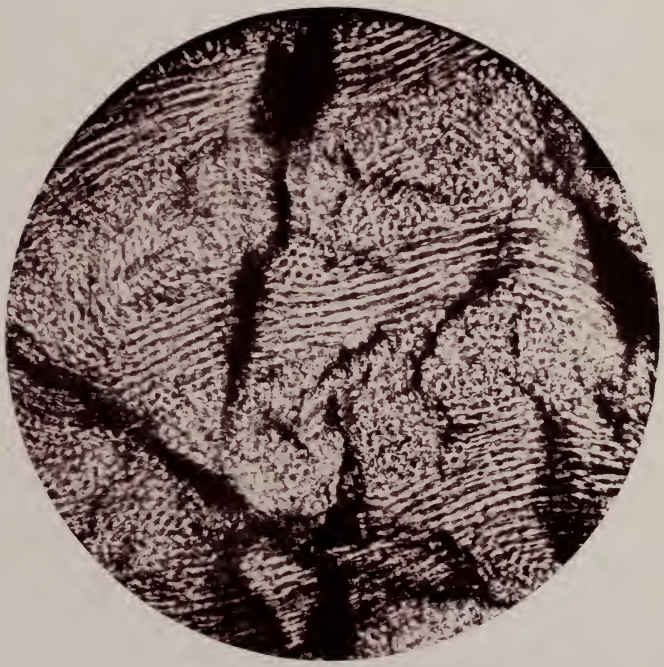


DESCRIPTION OF PLATE IV.

Section of enamel from the tooth of a dog. The dark places in the picture are caused by cracks in the section. Enamel prisms are seen longitudinally and transversely, in alternate bands. In those cut across transversely the roundish and hexagonal shapes may be seen. The shape of the prisms being determined by the amount of pressure to which the cells are subjected at the time of their calcification.

Magnified 260 diameters. 1-10 inch objective.

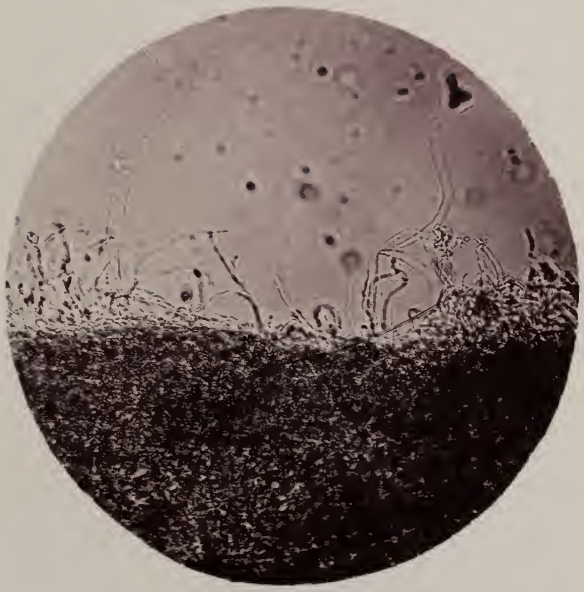
1-100 of inch.



DESCRIPTION OF PLATE V.

A portion of the root pulp of a molar. A freshly-extracted six-year molar, was cracked in a vice and placed in very dilute chromic acid (1-25 of 1 per cent.) for about an hour. On carefully removing the pulp from its cavity, the fibrils were drawn out from the dentinal tubes. Some of the fibrils show branches.

1-100 of inch.



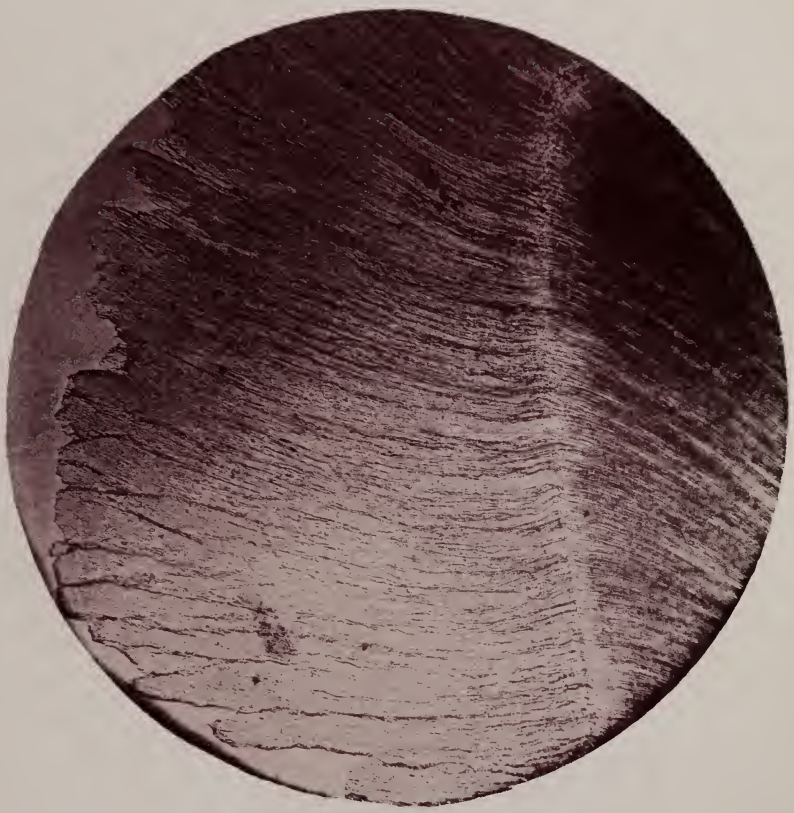
DESCRIPTION OF PLATE VI.

Section showing the penetration of dentinal tubes into the enamel.

The enamel with its fractured edge is seen at the left. At the right of the lighter boundary line is the dentine; tubes may be traced across this line in great numbers.

Magnified 100 diameters. ¼ inch objective.

1-100 of inch.



DESCRIPTION OF PLATE VII.

Section of a tooth showing faulty dentine, containing interglobular spaces.

The fainter spots toward the bottom of the picture are areolar markings. At the upper part, the enamel is seen with a fissure in it extending almost to the dentine; in the fissure, which is bordered by the *cuticula dentis*, is seen, somewhat out of focus, a lacunal cell.

Magnified 112 diameters. ¼ inch objective.

1-100 of inch.

DESCRIPTION OF PLATE VIII.

Section of a superior central incisor. The right of the plate is toward the cutting margin; a small piece of the enamel is seen at the right-hand upper margin of the plate. The uneven margins above and below show the walls of cavities of decay. The dentinal tubes are faintly seen in portions of the section; in other places they are obliterated. The reddish yellow color, which in the section of the tooth bounds the caries, also contributes to the darker appearance of these portions of the picture. Internal to this, and taking the shape of the former pulp cavity of the tooth, is a lighter tissue, the new formation, secondary dentine, the dentinal tubes of which are seen to be very irregularly disposed. The clear space at the left of the secondary dentine is the present pulp cavity. It is evident the pulp would have been exposed by the caries upon the upper portion were it not for the new formation.

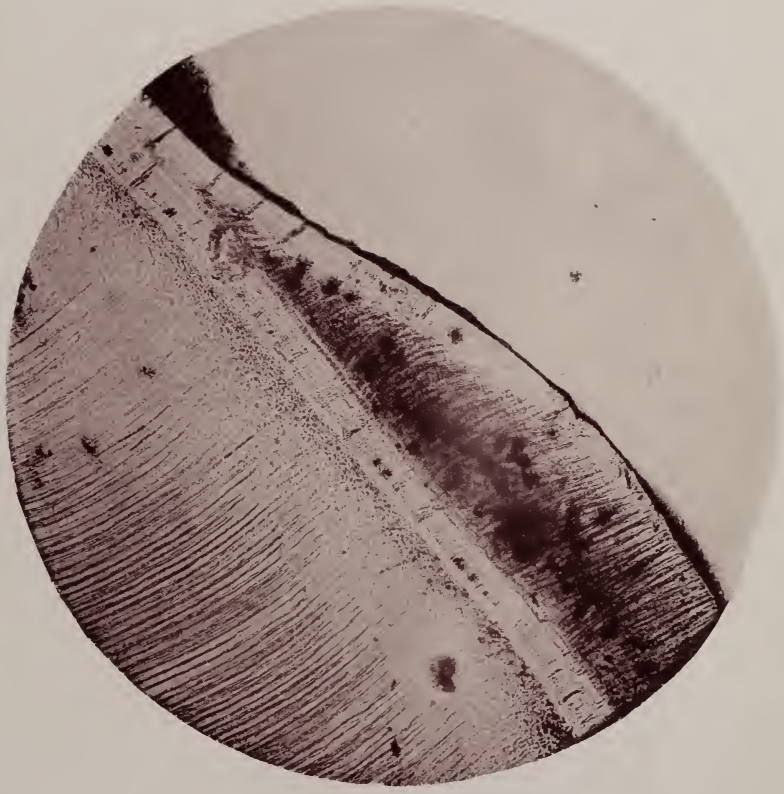
Magnified 12 diameters. 1½ inch objective.

DESCRIPTION OF PLATE IX.

Section of the root of a replanted molar which was worn four years. The original layer of cement is distinctly seen as a light band, about a quarter of an inch wide, covering the dentine. External to this is a thick portion, nearly an inch wide, containing many lacunæ, and which is covered in part by another layer of a homogeneous and more transparent tissue. The dentinal tubes are well shown, and at the line of union of the dentine and cement may be seen the layer of finely granular, calcareous substance, which is usually found between the two tissues.

Magnified 100 diameters. ¼ inch objective.

1-100 of inch.



DISCUSSIONS.

Dr. JUDD: In relation to these calcific deposits and new formations, referred to in the report on Histology, these formations are sometimes continuous with the dentinal structure, and, at others, connected with the pulp, and confined to the pulp chamber or nerve canals. There is a characteristic difference in the structure of these formations, apparently dependent somewhat upon their locality. Those found in the pulp chamber approach more nearly to the tooth structure than do those which are connected with the dentine. I have seen specimens containing well-developed dentinal tubes; others seem to possess no characteristics of dentinal structure. A recent specimen, which I prepared and examined, had all the appearance of dentinal tubes arranged in regular order, and as distinct as I have seen them many times in the healthy dentine. The influence these deposits have upon the dental pulp is various — many times causing intense neuralgic pains. These nodules in the pulp chamber are formed quite frequently in perfectly sound teeth. In reply to Dr. Taft, in regard to the treatment, I would open into the pulp chamber and remove the nodules, treat as in simple exposure, or remove the pulp entirely and fill. Sometimes these formations extend up into the canals, making their removal very difficult.

Dr. HITCHCOCK: In the cases referred to, you are very likely to find the cementum increased on the root.

Dr. MORGAN: As Dr. Judd has remarked, these nodules are frequently found in the nerve canals; and I think I have noticed that the pain consequent upon their presence is more acute when the nodule is connected with the dentine than when connected only with the pulp. In these cases I have sometimes observed an increase of the cementum.

Dr. ATKINSON congratulated the Association on having men who could make such observations as these.

He thought the calcification referred to in these cases indicated a return to lower types of dentification, as in the ruminantia, etc.

He said he had seen cases of long standing, which were probably attributable to want of exercise, by the patient avoiding vigorous masticatory efforts, and also sleeping with mouth open and jaws apart, depriving the teeth of the stimulus of hard contact, oft-repeated and long-maintained, which is the *sine qua non* to healthy development and effectual service of these organs.

In these cases of irregular and imperfect calcification of the bodies and processes of crown and root pulps, the size of the chamber and apical foramen become reduced, sometimes lessening, and at others stopping, the vascular circulation. In cutting such teeth in section, after extraction, had seen the nodular pulp hanging in mere shreds of pulp tissue, containing nodules, rods and spicula of calcified material in abundance. He indorsed the removal of loose nodules, and filling at once.

Dr. SMITH: A case came under my observation, bearing on this subject, which I will relate. A young man, suffering excruciating pain, had been under the treatment of a homœopathic physician for neuralgia, and finding no relief, applied to me. I examined the teeth, and found a filling on the grinding surface of the six-year molar. I removed the filling, and struck upon a stratum of ossified substance. Not being satisfied that the pulp was healthy, I penetrated into the cavity, and the gases evolved satisfied me that the disease was the result of pressure upon the living portion of the pulp. These cases should induce medical men to be more careful in their diagnosis.

Dr. CHASE had made a microscopical examination of the central portion of the crown of the six-year molar, in which many osteal cells were seen at the *large* ends of dentine tubes. The specimen was made of decalcified tooth substance from above the pulp cavity, which latter was not exposed.

ESSAY

ON

HISTOLOGY AND MICROSCOPY.

By W. H. ATKINSON.

THIS is a broad subject, deeply involved, complicated, profound, and occult; but beginning to take on scientific aspects.

Anything like a satisfactory account of the rise and progress of histology would involve a conspectus of the origin and career of the whole range of Natural History, Medicine, and Surgery. The study of these departments has brought to view whatever is known of histological or microscopic science.

The mere fact of our being in possession or not of the knowledge of science, art or commerce, neither creates nor annihilates any part, nor the whole, of the categories referred to. For they must be, to become catalogued as knowledge. Therefore the knowledge does not make or unmake any part of the field of contemplation in scientific or social order of life.

The so-called "exact sciences" become exact only by lodgment in the minds of those capable of comprehending the processes by which they are rendered regular and certain; or, in other words, by our becoming acquainted with the nature and career of physical and mental processes.

Histology can only be known through direct revealment to the consciousness, or indirectly through microscopical machinery. Hence the great propriety of coupling the two (histology and microscopy) in the caption of a paper setting forth whatever may be provable to the senses in the career of tissues and their elements in *associate* and *dissociate* presence.

This first glance at the subject startles us as we begin to take it into our consciousness in its comprehensive and dispersive aspects; for it really strikes at the foundations and superstructures of all knowledge of all kinds and degrees.

The MICROSCOPE is comparatively a modern invention. Therefore, there was no real knowledge of tissues before its discovery, invention, construction and employment; or, what was known came into consciousness through other channels. In fact, the possibilities and principles of the microscope had to find lodgment in the mind before it could be discovered, invented, made and used — each stage of the progress of the revealments of principles and possibilities, no less than the final summation, solution and applications to practice, requiring immediate influx. When we shall know what influx is, and be able to express it in understandable phrase, we shall have a basis of certitude in this department of science, as absolute as that known to pertain to the relations of number. All becoming, in physics and consciousness, depends upon afflux and efflux, and is only capable of cognition when complete. Just here is the great hindrance to equable and certain progress in attainment.

The recorded categories of past observations are so vague and embryonal, that they do not meet the mental appetite of the present with statement sufficiently strong, broad and clear to satisfy. All search for new and complete categories must proceed upon immediate influx, or recapitulations of former influxes, in reasoning upon the known to reach the unknown.

It will be profitable for us to ask what reasoning is, and to learn that it is a holding of the values of canceled processes in a sort of compressed essence in such a state as to polarize the mind so as to admit of a new influx (revelation) of the knowledge desired. Thus *sentiment* is inherited essence of logic, and by no means to be scouted or disregarded as non-essential to the attainment of truth.

Career of body and being, fact and function, in physics and consciousness, involves the questions of origin and destiny, or plan and purpose, in mode and manner of differentiation and indifferentiation of occupancy of habitat.

Confluence and diffluence are the diastole and systole of career to the departments in which they occur.

Body is echo of body, as shadow is sensuous proof of substance — substance being the substrate of spiritual and material forms of body — there being no possibility of body that does not partake of the dual primates of substance called spirit and matter inhering in it, in dynamic interdependence.

Histology to-day is crippled most in the house and hands of its own children and friends, by their persistence in carrying questions and methods of one category into another to which they are not adapted in nature, significance and use. For instance, it is still held to be important to "settle," as they say, the "priority" of "body or germ," "oak or acorn," "egg or hen." It is not yet "settled" what "germ" or "body" is. How then can "priority" of presence in any category be determined? Whether minutest granules shall be regarded as eggs, and what degree of ripeness of these shall constitute fitness for impregnation, or whether a sort of parthenogenesis holds genus, species and variety in its potential grasp, is not yet "settled" for all the forms already known. How infinitely less, then, can be "settled" the verities of the vastly more extended fields of the unknown bodies and careers that now so vehemently press for scientific revealment in the study of a true histology, until we can cancel and cast behind all that stands in the way of solution of body and process?

When we depended for demonstration of elemental bodies upon natural vision, we could only go to tissues as elemental. But when the microscope was revealed, the present acknowledged elements of these then elemental bodies were revealed to sight, and at once became the objects of study and controversy. And we now stand on vantage ground, and are able to solve previously insoluble problems of presence, and modes of presence of body and process. What, then, ought we to be ready to cancel and cast behind? Nothing of value, only the embryonal and transitional — not the fruits of these in values of verity.

At one time, and for the time appropriately, the solidal pathology held sway. In due time the fluidal made its advent upon the arena of function, and had its day of domination; but of shorter duration, in consequence of increasing intelligence and attention, the continued exercise of which in turn made it give way to the advent of the cellular pathology, ushered in by the use of the microscope. And now this is about to give up its differential dominion in

favor of the summation of all three in the concurrence of these in Pragmatic Pathology.

Pragmatic, or pronounced, pathology can only find lodgment in the minds of men by the study of body and process upon a plan so natural, general and definite, as to convince of its verity and applicability to the categories of function.

That every factor of function must be, before it can act, and act repeatedly in like manner to establish habit by which it may be known, must be apparent to all capable of thinking upon the subject.

The law of becoming, in body and function, is the law of succession or parentage.

Becoming can only be known by *revelation* to consciousness.

A seriating, then, of motion and modes of motion, is a necessity out of which categories may be evolved.

There are seven degrees or modes of motion regnant in the plan of individual being, small or great. And these may be nominated either way, but always in a regulated series down and up, or up and down.

Down.—1st, (Spirit) Power; 2d, (Vital) Force; 3d, Chemism; 4th, Electrism (including magnetism); 5th, Light; 6th, Levitation, and 7th, Gravitation.

Up.—1st, Gravitation; 2d, Levitation; 3d, Light; 4th, Electrism; 5th, Chemism; 6th, (Vital) Force, and 7th, (Spirit) Power.

The first or downward procession indicates what has been called "Creation." The second or upward procession is, Procreative, Functional, Elaborative, or Relegative (a seeking to return whence it came), and is the basis of *associative* and *dissociative* movements among the elements of tissues.

Gravitation holds the dominion of differential individuation. *Spirit* holds the dominion of indifferentiation, or sameness of all power and presence, and is the unitary cause of all motions and modes — therefore, the universal of Being in highest tension.

A striving between these two modes of tension produces Suns, Systems, Cycles, Circles, Planets and Inhabitants of Planets.

The tissues of our bodies hold the relations to the organs that the inhabitants hold to planets, and the organs hold the relations of circles and cycles to the system of organs that constitutes our individual bodies.

"Just as the study of the whole class of *Radiates* in general, and of jelly-fishes in particular, reveals the law, plan, type and methods of production (that so long defied proper classification, and now shows these methods of production and variation repeated and amplified in the higher and more complicated fields of geological research), and without an apprehension of which, persistently carried in the mind, can any zoologist make regular, rapid and profitable observations," even in the special department to which he may be devoted. Even so does the study of the seven modes of tension reveal cosmical and planetary law regnant everywhere among the largest and the least of individual — Cycle, Circle, System, Organ, Tissue, Cell and Molecule — wherever process is, actual, known or potential. In fact, until we apprehend that the whole is potentially, typically or analogically present in the least, or that the universe is this whole, whose presentment in departments capable of cognition presents us with the segregate modes of motion, or currents, in analogous, concurrent or competing presence, shall we be able to solve any problem in histology.

Becoming involves a deep and hidden or unseen current, or set of currents, that come from without, and appear within the range of sense.

This last word "sense" involves another realm upon which it depends, and without which it cannot be, viz: the realm of consciousness, the basis of all knowing, or knowledge of being, body and process.

The confluence of consciousness and physics posits individual being or beings.

The primal example of individual being is an ideal body denominated the Atom.

Confluence of *atoms* produces *molecules*, and aggregations of these constitute what are nominated *granules*. This last is the first and least body capable of making its presence known to the senses, and therefore stands as daysman between the ideal and corporeal domain of bodily presence. Aggregations of granules, in regular order, produce functioning bodies called corpuscles, cells, etc., according to the fancy of him who catalogues the objects under consideration.

I said the strivings of differentiation (gravitation) and indifferentiation (spirit) produced Suns, Systems, Planets and Inhabitants of Planets.

A mode of striving known as affinity (kindred) produces the different forms of molecules, and their modifications in granules, cells, tissues, organs and systems, under the tensions of afflux and efflux of currents of force, that make and unmake these bodies at the behest of type, plan, purpose.

Observation has taught us that "like produces like," and "unlike, diversity," in all the departments of individual and associate body. It also teaches the doctrine of cancellation of one form of body in the advent of another, in every example of production and maintenance of physical or functioning body. So that the débris of one grade of body becomes the food of the next to it, by reason of the differences of tension of force and form in the deficiencies or wants, and the sufficiencies or fullness, of the digestory receptacles of the bodies concerned. This teaches that state of depletion or repletion of body becomes the point of invitation to or repulsion of the currents of force that constitute the disintegrating and the integrating, or the destructive and constructive, processes of killing and chaotifying one body for the support of another — the *force* or *life* of which never dies, the form only dying, or rather changing by transmutation or metamorphosis into a more complicated or less complicated form in accordance to the surrounding influences within the sphere of the currents.

All the molecules, cells, tissues, organs and systems with which we are acquainted are but the channels of, and the results of, modes of motion, and they are mutually transmutable into each other, under the dominion of force, as certainly as that light, heat and electricity are modes or phases of motion — though more subtle, fine and evanescent than the bodies upon which we observe their effects — and are the occasion of the conversion of these forms of motion into each other.

So far as we yet see, by the best aids to vision, tissual elements arise in an apparently amorphous mass of what we now call Protoplasm (or first mould).

That which is called digestion, in the broad sense of feeding, consists in comminuting and solving the food, consisting of organs, tissues, cells and granules, into the amorphous molecular mass named Protoplasm, proteinaceous mass, chaotic mass, blood and pabulum, in which differentiation makes its advent, and does its

work of producing the factors of differential function in Sensory, Motory, Secretory and Psychic examples of function.

These are the phases of confluence of consciousness and physics that lay at the bottom or base, and set up the demand for the varieties of tissues as elaborators of the various functions called for to complete the system of organs to which they belong.

We use these terms with clearness of meaning and propriety of significance, or with ambiguousness of meaning and indefiniteness of understanding, in accordance with the time in which we write or speak, and the stage of our education or evolution of the knowledge of process and body, as displayed in the study of histology as seen by the help of a rapidly advancing microscopy.

In fact the microscope has so extended the domain of sight, and cleared up and amplified the apprehensions of body, that we now prefer to investigate for ourselves rather than to read the accounts of the researches of others, as guides to a knowledge of FUNCTION, which is the objective point of all histological acquirement.

Histos, a web, and *logos*, a discourse, are the etymological primates from which we derive our word Histology.

Some webs are made of homogeneous sheet mass; others are woven of fibrous or thread-like, line-like elements loosely or closely laid together to form the web or sheet.

Matter being indestructible, and Force being persistent, they must be regarded as aspects of a something upon which they depend, which something we may call SUBSTANCE, of which the universe consists — which universe, as a whole, is a plenum, and therefore understandable from the comprehension of any one of its systems within our reach for study.

What we call extremes of size are only so by way of accommodation of phraseology. For the molecule, too small to be seen by the assistance of the highest microscopic amplification, is not an extreme but a mean of expressions of force and form, which mean raises it out of the range of mere atoms, and makes it no longer an elemental but a compound body, endowed with new and complicated affinities by which it may be related in manifold method and mode. On the other hand, the astronomical bodies, territories and spaces have been also denominated extremes only, again, by way of accommodation; for, as our knowledge increases, our ex-

tremes become only the mean of that which is ever ready to be and ever is revealed as but the mean between the known and the about to be known.

So, if we would solve the problem of the universe, we must understand the relations of the parts of systems to each other, and thus become acquainted with the analogies that unfold the laws of the whole. The only way that this can be done by one person is to take examples of systems of short career and small dimensions, and so transparent as to reveal the metamorphoses through which they pass from inception, ripeness and decadence, to disruption and dispersion into the elements whence they came.

Fortunately for us, many examples in the vegetable and animal worlds afford us such opportunity. And we may repeat our observations until the whole range of production, growth, death and dispersion is familiar to us.

This patient watching of the ripening of germs, their impregnation and evolution into adult form and fruiting again, is but the true work of the histologist.

The finest naturalists are to this day quite unable to distinguish between the germs of the various orders of animal forms by microscopical or chemical analysis; but this need not induce us to assert that this can never be done.

Natural philosophers uniformly assert the impossibility of our ever being able to demonstrate the size of the atom. I regard it as hardly safe to longer iterate this saying; for the distance between these small bodies called centers and origins of motion (viz, the atoms) has been proved to be near the two hundred millionth (200,000,000th) of an inch by late discoveries in the wave-lengths of different color-rays.

One of the most important of analogies is one that holds good in all forms of individual body, be it large or small, viz., "room" in which to work, sometimes called atmosphere.

The simplest motion is breathing — afflux and efflux. This lays the foundation of change, and is the initial of function in suns, planets and inhabitants of planets.

The deciduous character of the terræ, floræ and faunæ of planets, and of the tissues of our bodies, are but the truly physiological processes by which the planets and our bodies come to their maturity, so as in turn to enrich the soil of the system to which each belongs,

and thus take part in the completing of higher and ever higher career in the never-ending line of progress of a divinely appointed endowment of power.

As deep of solar fullness calleth unto deep of planetary void, in the vast macrocosm of cosmical tissues, so calleth the atomic, molecular and psychic deeps of sense of deficiency to the deeps of pabulum of proteinaceous seas, and the deep of the sea of knowledge, to be infilled with the influx that satisfies by repletion of tissual, organic and psychic supply.

The blood corpuscles are the seed bodies of the various tissues, and the fluid blood is the food of the elements of the tissues, whereon they are sustained and enabled to do the work of organic and systemic career, as they take the place of the worn-out corpuscles and cells by pushing them to the surfaces to be shed as secretions, excretions or dejections unfit for further systemic use.

The duration or length of systemic career depends upon the condition of the organs that constitute the system.

And the term of continuance of the organs, in working condition, depends upon the supply of the tissues that together constitute the organs; and the renewal of the tissues also depends upon a supply of corpuscles (cells) that together form the filaments, fibers and webs of tissues of the various kinds by what has been called alternation of generation of these elemental bodies.

Thus it is evident that COMMUNION is the basis and formative act of society of all kinds and degrees, by which cosmical, planetary and subordinate systems are formed and maintained.

It will be thought to be "far-fetched," "misty," "cloudy" and "irrelevant" by many, if the attempt be made to name the process by which suns are produced, and to indicate the analogy that is the key to all function, in the result, on a cosmical scale, of the single law of gravitation.

Nevertheless, as heretofore, I take the risk, with only one request as condition, on the part of those who object, viz, that they be logical enough to wait until the statement is made and taken into account, before deciding for or against it.

To get at the analogy at the nearest point to us of the cosmical systems among which this earth holds its course, let us state a certitude as if it were a hypothetical proposition, and we may be the better able to catch the significance of analogies. The moon is

nearing the earth. When it comes in full contact with the earth its mass-motion will be converted into molecular-motion, which will fuse both masses of moon and earth, and disrupt molecular affinities, setting them free to reduce the conjoined mass to a sun.

The function of *sun* is radiation, or giving. The function of planetary *void* is asking to be infilled—(demand).

How many moons the earth has had, and how many times it has been partly or wholly reduced to a state of sun, remains to be read by the records safely laid up in its crust; just as the scars in our bodies reveal the traumatic and functional lesions that have in succession held the dominion of nutrition in our bodies and marred the regularity of the arrangement of the elemental bodies composing the *scar-tissue* that will reduce them to earth-mould again so soon as it (scar-tissue) attains the balance of force in the systemic economy.

As habitable planets are produced by cooling down of suns through atomic satisfactions of *desire*, in the formation of ethers, gases, vapors, waters, colloids and solids; just so do satisfactions of molecular affinities produce the varied tissues whose concurrent gyres supply the organic and systemic functions, whose summations produce psychic or affectional and intellectual function in harmonial expression. And thus the planets become peopled with the various inhabitants in orders, classes, kingdoms, genera, species and varieties, in obedience to intelligent desire resident in elements seeking UNION.

Thus degrees of desire are the measure of the degrees of nearness of elemental bodies that constitutes what is called satisfaction of affinity. Therefore nearness and distance determine the quality of body. Thinnest, softest body is spirit body. Thickest, hardest, densest body is natural body. Therefore body, to be body at all, must have not only some degree of thinness, tenuity, but also of thickness, staticalness, stillness; and we therefore have to invoke force and form as the necessary elements of body, be it largest or least.

The difference, then, of that which occupies the interstellar spaces and our atmosphere is but a difference in degree of tenuity, and not in quality of matter. Hence all systems float in an identical ocean of substance, in which they subsist by degrees of teleo-

logical (distant), medioxumous (middle), and terraqueous (earthy) tensions of desire.

The *absolute* being incomprehensible to the finite mind, we can only deal with *relative* origins and careers of being and process.

MIND, being the exercise of consciousness in seriated perceptions, involves potential and active modes which constitute the seriating, or the beginning and completing, or finishing, of the special putting on and taking off of the tensions that comprise the mental acts.

A perfect analogical understanding of any one of the seven aspects of endowment of the power to *unite*, from gravitation to spirit-power, involves knowledge of the whole domain of histology in the demand and supply of factors of function, in concurrent and divergent careers; which we now proceed to formulate in the order of their occurrence in creative and procreative procession.

Confluence of consciousness and physics produces:

1. Confluent tissue, in nerve-mass, which subsequently differentiates into vesicular and fibrous forms of neural tissue.

2. Limitory tissue, in elastic, non-elastic and mixed forms of fiber.

3. Motory tissue, in voluntary, involuntary and mixed examples of muscles.

4. Secretory tissue (or glands), in lymphatic, conglobate and conglomerate forms. Ending in

5. The production of Statical tissue, in shells, bones and teeth; the last made up of three forms in cement, dentine and enamel, to meet the demand of statical requirement in completest degree in the last, which is composed of prismatic rods or crystals.

The offspring of confluence of atoms are molecules, the offspring of molecules are granules, and confluence of these produces corpuscles and cells, which are the elements of tissues, out of which the statical, limitory, motory, secretory and confluent varieties of tissues are formed, under the guidance of the differential types of tissues in: 1, Bones; 2, Fibrous or connective tissues; 3, Muscles; 4, Glands; and 5, Nerves, as the basis of a *mentory* apparatus which is the highest example of congeries of nerves or confluent tissue at present known. In this refinement of functioning body, automatic and instinctive intelligence becomes conscious intelli-

gence, whereby histology and microscopy, and every other example of differential science becomes possible.

Hunger resides in the needy territories. The location of the *demand*, therefore, must be the seat of function.

Function is effected in the individual elements of the factors of function, which are called corpuscles or cells, according to our wont, habit, or school.

Hunger being appeased or satisfied, the demand abates or ceases.

The stomach is the grand *entrepôt* of supplies for the whole system, and therefore for its own individual cellular necessities in its proper tissues, as well as for the rest of the organism, and only contributes its modicum of demand.

The mere filling of the stomach does not annihilate appetite, although it may appease, in a degree, the urgency of the sense of demand by mechanically distending the stomach, thereby forcing the blood-plasm within the intercellular territories more compactly against the needy bodies, thus favoring the appropriation of pabulum before out of the reach of the sphere of cell influence.

Upon the *intelligence*, then, of the cells do we find the satisfaction of hunger to depend, as certainly as that the formation of crystals depends upon chemical equivalency; which is but an example of *atomic intelligence* that knows when it is satisfied — saturated!

Crystallization, cellulation and corpusculation are the differential modes of absorption of radiance of sun-presence, and have their differential termini in the mineral, vegetable and animal kingdoms; all three of which are represented in the human system.

As protoplasm is, in first form, sea-foam — *schleim*, as the Germans have it — it will be well for us to inquire the origin of slime of the sea — sea-foam — meerschaum.

Bubbles of the sea are the results of five modes of motion or tension, viz: centripetal, centrifugal, orbital and revolving motions, and the absorption of sun-radiance.

Centripetal motion is solar attraction.

Centrifugal motion is the tending of a moving body to go in a line.

Orbital motion is the resultant of these two; and Diurnal is revolving motion, or rotation on axis.

Sea-foam arises out of the conflicts of the confluence of these currents of motion, in analogous, concurrent and competing presence at the junction of the atmosphere and the sea, or air and water. Protoplasm, or sea-foam, takes its origin here, and is the basis of all tissue of rock, plant and animal. All belonging to rock or mineral is given to the domain of crystalosophy; that belonging to plants, to cellosophy, and that belonging to animal is remanded to the domain of corpusculosophy, which holds the values of the preceding two other forms of typal dominion. Therefore, in treating of corpusculation, cellulation and crystallization are understood, as possible change of the dominion, as well as that of solution and reduction to protoplasm again.

CELLULATION: I have chosen this term as one least liable to the objections of novices who deem themselves able to assume the role of the expert. Investigators who are afraid of con-se-quences, or are restive under con-vic-tion are not yet mature philosophers.

In using the term cell, to stand primarily for the least body capable of exercising vegetable or animal function, we avoid the conflicts coming out of the study of its origin, in this place, and shall have less cause for limping if we do not forget ourselves and allow our minds to wander from the line of alternations in the onward career of these primates of tissues, in their joint work of producing and maintaining organs and systems.

The differential function of cell is a complication of reception, transmission and absorption of force. This is the work of cell proper. And, as all forms of work wear the worker, (I will not say waste the worker, for this only occurs in doing needless work,) the worker must be renewed or exchanged at each effort, so that career or continuity of work may be secured.

How may we determine cell career? I know of no other way to do this so satisfactorily as to watch the development of the various cells and products of cells in plants and animals as they do the work of their careers in the appropriation of pabulum, working and twisting into tissues, and successively crowding their predecessors to the surfaces of organs, to be shed when no longer fit to constitute any part of an organ.

SECRETION and EXCRETION are examples of moulting of the elemental primates of tissues.

In the example of secretions, the peripheral cells are shed, in

diffluent mass by solving entirely, and bodily, by solution of their points of attachment on all sides. When the shed corpuscles, solved, partly solved, and entire, are to serve other than lubricant uses, they constitute a *secretion;* when in excess, or effete, they constitute what is called *excretions* — both secretion and excretion being the example of end of career of corpuscles and cells.

After this succinct nomination and tracing of career of tissual elements from the first appearance of blood corpuscles to its exit in shed epithelium, it will be well to study the following tabulated series of modes of motion and metamorphoses of bodies and processes before applying ourselves to the grand retrospect, introspect and prospect that completes these mere headings of Histology and Microscopy.

VII. Spirit Power.	Glacial and Recent. (Cenozoic.)	Seeding Plants. (Dicotyledones.)	Spiritual Sense.	Intuition.	Spiritual Love. (Love of God and Heaven.)
VI. Vital Force.	Tertiary. (Mammals.)	Fruiting Plants. (Exogens.)	Binocular Sight. (Mental Sight, Reason.)	Reason.	Universal Love.
V. Chemism.	New Red Sandstone. (Lias, Wealdon, etc.)	Flowering Plants. (Monocotyledones.) (Endogens.)	Smell.	Reflection.	Filial Love.
IV. Electrism.	Carboniferous	Leaf Plants. (Ferns, spores on leaves.)	Hearing.	Imagination.	Fraternal Love.
III. Light.	Lower Fossiliferous. (Silurian, Cambrian, etc.)	Tracheal Plants. (Branches.)	Monocular Sight.	Memory.	Parental Love.
II. Levitation. (Apartness.) (Expansion.) (Heat.)	Stratified. (Azoic.)	Duct Plants. (Trunk.)	Taste.	Conception.	Conjugal Love.
I. Gravitation. (Togetherness.) (Contraction.) (Cold.)	Igneous. (Amorphous.)	Cell Plants. (Root.)	Touch.	Perception.	Self Love.
Motism. (Modes of Motion.)	Mineralism. (Attraction and Repulsion.)	Vegetism. (Botany.)	Animism. (Animality.)	Mentism. (Intellectual Faculties.)	Emotism. (Affectional.)
VII.	Pneumatogeny. (Emotism.) (Spirits.)				
VI.	Psychogeny. (Mentism.) (Rational Natures.)				
V.	Biogeny. (Curvilinear.) (Vegetism and Animism.)				
IV.	Cosmogeny. (Rectangular.) (Mineralism.)				
III.	Morphogeny. (Annulated.) (Offspring.)				
II.	Pantogeny. (Motism—b.) (Pater.)				
I.	Substance. (Motism—a.) (Mater.)				

GRAND RETROSPECT, INTROSPECT AND PROSPECT OF BEING, BODY, AND PROCESS.

When the *desire* to have associates went forth from the divine counsel in the heavens, and was expressed in the recorded "Let us make man," the foundations of *society* were firmly laid in the very *inmost nature of the creature* that was there and then pronounced "very good." If good then, and *very good* at that, where is the door or even hint of point of entrance for anything but good?

Absolute or abstract good is incomprehensible, therefore out of the question now. That which supplies a demand, fills a need, is the only good that can by possibility be so called. Therefore, that which is good to the needy, and satisfactory to his estimation, is indifferent or repulsive to another who is full and lacking nothing of which his sense takes cognizance.

To walk "together" we must be "agreed" (*i. e.*) in like or similar states and conditions of necessities in deficiency and sufficiency.

All those who deem themselves their own keepers, and able to take yokes upon their necks that neither they nor their fathers were able to bear, have quite forgotten to ask to be led.

Under a sense of the truth of the Scripture that saith, "It is not in man that walketh to direct his steps," our helplessness is ever before us, and in our deepest consciousness we are sure that desire is before will (volition), and spontaneity before calculation.

Obedience that is not instant and spontaneous is but second rate at best, and brings but partial sense of satisfaction to the soul — the plane of the sense of need, or appetite.

Those who "serve" the Divine from a "sense" of duty only blasphemously give remnants of their affections, and are trying (Simon-like) to buy their way to heaven. All such have but embryonic ideas of heaven, forgetting the saying, "the kingdom of God is within you."

Without opposites we have no differential, sharp apprehensions of state or place. Therefore both hell and heaven are involved in what is called happiness. A proper use of hell converts it into heaven, and an improper use of heaven transmutes it into hell.

Until serial order of the development of body and mind be formulated and taught, shall we ever come to our mental and moral

majority, in which we are a Law (Lord), unto ourselves in which our spontaneities ever concur with the behests of the Law (Lord).

"Are there few that be saved?" Verily, few indeed attain to mental and moral *childhood* even, at first efforts at evolution of the complete being.

Childhood in the growth of the body is reckoned from the first to the seventh year, youth from the seventh to the fourteenth year, and adolescence from the fourteenth to the twenty-first year.

The moral and religious life has also a serial order of correspondence with this formula. But where are the living examples of the youth and adolescence of these categories? Echo answers, where?

In natural history the mineral kingdom has been regarded as non-living. The straight lines of this kingdom, and the possible forms of body producible by their intersections and conjunctions, are but statical forms devoid of active motion, therefore called dead-forms.

All morals and religions based upon "authority" (external domination) are but the mineralistic analogues of morals and religion, only useful as base or sub-stratum upon which to erect the *Paternity* and *Immanuelism* for the establishment of which they were produced, as stages in the growth of æsthetic society among men.

The "lording it over God's heritage" in religious circles, governmental bodies, schools and scientific societies, is fast falling into the mere stages and periods of geological record of past dominations of forces now canceled and carried into higher fields and broader realms of usefulness; although the incumbents of popedoms, priesthoods, and professorial chairs take little cognizance of the departure of their energies.

If, then, "the fine gold has become dim, and the beautiful garments moth-eaten," where are we to look for safety? Evidently not in tarrying where we are, nor in going backward; but in a ready acceptance of the beckonings of the heavens that hold out kindly hands to charm us out of the necessary hells of development into the embrace of higher, purer, diviner degrees of acquiescence in the Love and Wisdom that energizes and pacifies—"*satisfies* every living thing."

Not in conservatism, not in retrogression, not in head-religion and formulæ, however fascinating to the senses, shall we find our

account, but in ready obedience even unto death, with the ardent exclamation of, "As it is written in the volume of thy book, lo! I come to do thy will, O God!" And thus, without hesitation, and with the sweet ecstacy of divine abandonment, rush to the fulfillment of every requirement of Light and Life, of Law and Love, reckless of results by the very ardor begotten of obedience, and, dancing on the foam of the breaking crest of the advance-wave of real progress, catch and appropriate the divine afflatus of PERPETUAL ADOLESCENCE — the birthright and inheritance of the sons and daughters of the Almighty!

REPORT OF THE COMMITTEE

ON

DENTAL EDUCATION.

By W. H. MORGAN, Chairman.

LOOKING to the future of our profession, no single subject looms up with such significance or such transcendent importance as that referred to this Committee. Upon the plan marked out and followed by those of our profession who are now leaders in this matter of Dental Education depends the future status of the profession; not only its status in attainments, but its position and influence among the learned and cultivated of this and all other civilized countries. And in this status every member of the profession must share, to some extent, whether it is his will to do so or not.

With this view, do we realize, both as individuals and as an Association, our responsibility? Have we been sufficiently broad in our views and efforts upon this subject, or is it not lamentably true that we have been narrow and practical, demanding of those seeking admission into our ranks a very superficial knowledge of science in general, and only a respectable moiety of manipulative ability? Such, we affirm, is the truth.

How shall we remedy this evil?

A professional gentleman who recently visited us, from abroad, with the view of examining our system or mode of dental education, seemed to be impressed with the idea that we kept too much aloof from the medical profession. From his standpoint this is true. He perhaps did not know that this was not of our seeking, and that we had been driven, by the ungenerous course of the medical profession in America, into this relation; that we have been forced to organize schools and colleges to teach what it was their duty to impart.

Dentistry is a specialty of Medicine, and should be taught as such. That it is a specialty of Medicine is, we believe, the highest claim that has ever been made for it. If this claim is founded upon truth, what is the legitimate inference as to how a knowledge of it should be acquired? Surely that it should be taught and learned in connection with a Medical College, as are other specialties of Medicine. Men should be qualified for the practice of Dentistry as is the surgeon, aurist or oculist — upon the broad basis of a general knowledge of Medicine. It may be said that our colleges and universities are not prepared to teach our specialty. So much the worse for them; so much greater the discredit to our institutions. Let them prepare themselves for this duty, and meet the solemn demands of humanity. Let a department of Dentistry be added to so many of our universities as will meet the demand, and then let degrees be conferred upon general merit rather than upon special attainments. Let us see, in our annual announcements, no such word as "optional" after Anatomy — but let all our institutions which propose to qualify men for the practice of Dentistry clearly set forth the idea that it is a specialty of Medicine, and must be based upon a thorough knowledge of anatomy and physiology; that these, with other collateral sciences, constitute the foundation upon which Dentistry as well as Medicine must be practiced; otherwise it is the merest charlatanism. It will not do to say that in our medical colleges an improper direction or application is often given to the truth of science — a general and not a special application. We tell you that the student who is incapable of applying general principles to his specialty is unfit to be a dentist, unworthy of a degree, and should be rejected for want of capacity.

We would therefore recommend that, whenever practicable, our universities should have a Dental Department. That the course in histology, anatomy, physiology, etc., should be as long and as thorough as is required of any class of students, before graduation; and that the final examination should correspond with such teaching. This is the point where we think the great evil of superficial attainment begins with dentists.

The writer of this short and imperfect article has held substantially the above views for more than a quarter of a century, and over twenty years ago sought most earnestly to ingraft them on at least one of the then prosperous universities of his adopted State.

ADDITIONAL REPORT

ON

DENTAL EDUCATION.

By E. J. WAYE, a Member of the Committee.

UPON Dental Education, strictly speaking, I have no report to offer. My subject is one, however, which it is believed may be made to exert upon it an influence so salutary as to commend it to careful consideration. I refer to laws regulating practice and fixing the standard of *Dental Education.*

Two years ago, Dr. C. E. Francis, in a report read before you, made use of the following expressive language:

"So long as a host of illiterate characters or bungling empirics drag heavily at our skirts, hampering and tinkering in a manner as discreditable to the profession as damaging to their victimized patients, so long must we, as a body, expect to share the odium that must naturally fall upon their heads.

"We think a strong effort should be made to rid the profession of this incubus — this dead, worse than useless weight."

"We hope the time is not far distant when every State in the Union will secure safety to its citizens, by enacting a rigid Dental Law, requiring every practicing dentist to show evidence of his ability and fitness to practice dentistry upon sound principles, combined with proper manipulative skill."

These words express the feeling of most of the best men in the profession, I suppose, both as to the existing evil and its remedy; I need not, therefore, enlarge upon what is so generally understood — the abuses of dental practice, and the necessity of reform. As for the remedy, few, I presume, will differ from Dr. Francis in his prescription of a "rigid Dental Law."

Assuming, then, that legislation is the best mode of action, we come to consider what the law should be which will best subserve the interest of both the community and the Dentist.

I conceive that any law which requires of the Dentist a certain amount of education, which he does not already possess, must necessarily be prospective in its operation; that is to say, that time to acquire what is not already learned must be allowed. This is equity; and unless we desire to thrust out of the profession a class of men who in many essentials are among the best in it, such provisions must be made. It is not always the men who have received a collegiate education, and a diploma, who are in reality the most successful dentists, or the most worthy and high-minded men.

Many who know *very* much less than they should of anatomy, physiology or pathology, are in all the practical operations of the office and laboratory, quite the superiors of some who in the extent and thoroughness of theoretical knowledge far surpass them. These studied in the dear but reliable school of experience and observation, perhaps the only one open to them at the time; and though their knowledge is circumscribed, it is both practical and thorough, and forms an excellent foundation, whereon to build a superstructure. There are many such in every State, and they should be made to understand that law is not designed to drive them from the profession, but to elevate and protect them in it.

The Dental Law of Ohio, as originally enacted, was, in most respects, perhaps as well adapted to effect the desired reform as any yet devised. Its provisions were briefly these: a board of examiners chosen from and by the State Dental Society, with power to grant certificates to such as passed a satisfactory examination, and to refuse all others. Such certificate or a diploma from some Dental College of respectability, making the holder eligible to practice in Ohio. All others were prohibited under penalty of a fine of not less than fifty nor more than two hundred dollars for each offense.

Four years were granted wherein to prepare for such examination, during which time all were allowed to practice unmolested, and none were obliged to appear before the Board until the expiration of the allotted time.

Herein, it is believed, was the grand mistake which rendered the law during the whole four years practically inoperative, and which resulted, at the end of that time, in an amendment by which its influence for good was seriously impaired, though not rendered wholly nugatory.

This amendment makes five years' practice equivalent to a certificate from the Board, or a diploma from a Dental College.

As amended, it is unfair in its operation, requiring of the young man entering the profession, a thorough course of office study and tutelage, two full courses of lectures, and a diploma from a Dental College of good standing; while it permits any man to remain in the profession, who for five years previous to its passage had been in actual practice, though each day of that period he had been an empiric, a fraud, and an injury to the community.

Thus the law became purely preventive, and not truly equitable. Now, suppose that provision of the law to be modified in this manner: grant three years wherein to acquire the knowledge requisite for a certificate; but bring all before the Board at once.

Where men fail, (and many will,) make it the duty of the Board to designate wherein, granting such time as in its judgment seems necessary — say one year — and permitting them to practice in the interim. That period expired, let them be again examined. If they have made progress, but are still below the standard, encourage and grant further time. Continue this for the prescribed period under the law, and how many, think you, who deserve to remain in the profession, would be found outside?

Under this provision the board of examiners becomes also a board of educators, and they should be composed of men who *are*, or, at least, are competent to be such. Conducted in this manner, the examination is robbed of half its terrors. It is no longer a relentless Inquisition, propounding perplexing questions upon abstruse subjects, whereof the confused applicant, having no previous knowledge, might have no means of finding the required answers, failure in which subjected him to an ignominious expulsion from practice; thus reversing college precedent (study and lectures first, examination afterward), which is both unjust and unreasonable.

Any law, however mild, which will remedy the evil, must drive out of the profession many who now thrive within it. This class will be the law's most virulent enemies. Is it not important, then,

that the law be so framed that the influence and co-operation of the really worthy may be secured in its favor? Either this or some kindred measure must be adopted, or a certain amount of experience in practice be accepted in its stead; and no amount of ignorant and reckless practice ought of itself to entitle a man to remain in the profession, or be accepted in lieu of knowledge.

We must have guaranty of reform; and reformation implies study, and study requires time. Gentlemen, if a Dental Law be a necessity, then, to accomplish the good intended, it must be so framed that its execution wrongs no man, but rather confers upon all, both community and the Dentist, permanent good.

Such an enactment, to be most effective, should not be the law of a single State. Uniformity in this instance would be an increase of power. As in Dental Ethics, until this Association elaborated and published its celebrated code, now almost universally adopted throughout the Union, nothing definite and pronounced of good resulted, though nearly every society held one of some kind.

So, it seems to me, it may prove as to a Dental Law; and it is respectfully submitted whether, on the part of the American Dental Association, (the highest authority in its specialty in the land,) it were not a wise policy to devise such a law as in its wisdom it deems will best subserve the interest of both the profession and the people; to the end that being adopted by every State it may secure that uniformity of law and unity of action which is so powerful an element of success.

REPORT OF THE COMMITTEE

ON

DENTAL LITERATURE.

By GEO. H. CUSHING, CHAIRMAN.

SOME months ago arrangements were perfected between the members of this Committee, whereby it was expected that a full and comprehensive report would at this time have been presented. But the member who was to have reported upon new books, having subsequently decided upon a visit abroad for the benefit of his health, felt compelled to decline to serve, and the duty consequently fell upon your Chairman. This change was made so recently that it was impossible for this branch of your Committee to give sufficient time to the work, which was needed to enable them to properly fulfill their duty; so that, except so far as the periodical literature is concerned, this report cannot pretend to be sufficiently full or comprehensive. The endeavor will be made, however, to glance over the field, and at least not to do injustice to such works as may be here considered.

The period of time over which this report should extend — from 1871 to the present — is a very marked one in the history of the literature of our profession. During this time a greater number of works have been published probably than in any preceding ten years, and works of a much more valuable and scientific character. Thus we have the second edition of "Tomes' Dental Surgery;" the second edition of "Garretson's Oral Surgery;" "The Pathology of the Teeth," by Prof. Wedl; "Dental Caries and its Causes," by Drs. Leber and Rottenstein, and "Treatment and Prevention of Decay of Teeth," by Dr. R. Arthur.

"Tomes' Dental Surgery, second edition, by John Tomes, F.

R. S., and Charles S. Tomes, M. A."—This volume, in its revision and enlargement, has for its author, it is presumed, only Mr. Charles S. Tomes.

In the preface to the second edition we are informed that "though large additions to the text have been made, yet the bulk of the volume has been kept within convenient limits by a slight reduction in the size of the print. That those portions of the book which are devoted to the description of neuralgia, dentigerous cysts, odontomes, secondary affections resulting from the irritation set up by dental disease, as well as many other shorter sections, are entirely new; and nearly sixty fresh illustrations have been added. The description of dental caries, with the exception of some slight additions and alterations, remains much the same as in the first edition; but a fuller discussion of the whole subject has been added, in the form of an appendix, in which a summary of the conclusions to be drawn from recent investigations will be found."

It is needless to refer to the general character of this work, which in its first edition occupied perhaps the highest place in our literature; and in commenting upon the second edition your Committee would state, that they have looked through the book carefully, and have read, with greater care, the sections which are entirely new. Copious additions are made throughout the work to the original, bringing it down to the present time, with a record of the best and most scientific theories and practices yet produced. The section on Neuralgia is a very valuable addition to the work, and presents the subject in a fuller and clearer manner perhaps than any other publication has heretofore done. In the discussion of the causes of neuralgia of the fifth pair of nerves it is clearly established that diseased teeth are by far the most frequent, even in a large majority of those cases which, by the generality of writers on this subject, are referred to other causes. Our attention, as practicing dentists, is especially challenged by this chapter, by reason of its direct bearing upon our daily practice. The chapters upon dentigerous cysts, odontomes and secondary affections resulting from the irritation set up by dental disease, are equally well written, and add largely to the value and interest of the work. The appendix is a very excellent *résumé* of the more recent investigations touching the pathology and etiology of dental

caries. The conclusions of the author, drawn from these, is thus summarized: "The following conclusions seem to be most nearly in accordance with the preceding facts, viz.: That caries is an effect of external causes, in which so-called 'vital' forces play no part; that it is due to the solvent action of acids which have been generated by fermentation going on in the mouth, the buccal mucus, probably, having no small share in the matter; and when once the disintegrating process is established at some congenitally defective point, the accumulation of food and secretions in the cavity will intensify the mischief by furnishing fresh supplies of acid."

It will be observed that the author denies to so-called "vital" force any influence in the matter. Your Committee are of the opinion that some weight might justly be allowed to the theory of a greater or less power of resistance to destructive agents as being inherent in the teeth, which might be designated "vital" force, for want of a better term; and they think that many facts might be adduced in support of this theory, quite as strong in their evidence as many of those which led the author to his conclusions.

The new matter which has been added to this work shows the author's familiarity with the best authorities, as well as the evidence of his own careful researches and investigations, and of his thoughtful conclusions.

It is written in a clear and concise style, free from arrogance, giving due credit to other observers and authors, but expressing the convictions of the writer with firmness and confidence, and generally giving logical reasons for such conclusions. Of course it would hardly be possible for a work of this kind to be written that should not be open to criticism, in some minor points at least; and doubtless many American readers would find some faults which would not appear to the English or Continental student. Thus, while in his additions to the department of Operative Dentistry he makes mention of the use of oxychloride of zinc, as a capping for exposed pulps, he evidently does not give this method of treatment the prominent place to which a large number of leading American practitioners would doubtless deem it entitled. And so with regard to new methods of operating, which are considered of great importance and value in this country, he either notices them but briefly or not at all.

Your Committee noticed one thing with regret, which was, a

seeming disinclination to give credit to American inventors or authors. Thus, in speaking of the mallet, he gives the credit to the Americans for bringing this valuable assistant into every-day practice, though not for originating its use, as we are told in a foot-note that "Dr. Hoffman, of Margate, was many years ago in the habit of consolidating the gold by malleting;" while in speaking of the "rubber dam" no reference is made to the originator, or even to the country that gave it birth. This is the more noticeable, because he evidently appreciates the greater importance and value of the rubber dam, as compared with the use of the mallet. It is more noticeable, too, by reason of the evidence of fairness throughout the work, as to giving credit generally where it is due. We have no idea that this was an intentional slight, but it could not fail to attract the attention of the American reader, because of the very great importance which American practitioners place upon the rubber dam.

As a book of reference it is faulty in its arrangement, not being sufficiently divided into chapters, with prominent headings, which would at once inform the reader where to look for the discussion of any particular subject.

Yet notwithstanding these defects, the new edition of Tomes' "Dental Surgery" must hold the place in the highest rank among our text-books of to-day that the original formerly occupied, and should be read by every dental and medical practitioner who would keep himself fully up to the progress of the age.

"A System of Oral Surgery; being a consideration of the Diseases and Surgery of the Mouth, Jaws, and Associate Parts. By Jas. E. Garretson, M. D., D. D. S."—

In the preface to this, the second edition of the work, the author says: "The present volume has been entitled a system; a system the author has exerted himself to make it, step by step, from the elements of the subject — from the first departures from normal life — attempt has been made to follow the various conditions to and through their profoundest complications. During the writing of the book the author has had continuously in mind the recognition of the important fact that in no department of medical science has there existed a hiatus such as that found to-day between General Surgery and Dentistry,— a lacking span, truly, in the bridge of practice. * * * To bridge this gap by supply-

ing the lacking span is the highest ambition, as it has been the almost life-long labor, of the author."

The first half of this work is devoted to a system of "Dental Surgery," in its restricted sense. This has been carefully examined; and though your Committee fail to find that it commends itself to the dental practitioner by any general merit not possessed by other works on this subject, yet it is desired to call attention to a meritorious feature not pertaining to most other works of this nature. Reference is here made to the fullness with which Dr. Jack's method of filling with matrices is treated, and also to the elaborate descriptions and instructions given concerning the application of the rubber dam.

In treating of details of practice of as great importance as these referred to, text-books cannot be too explicit in describing the best methods of manipulating, for the benefit of the student.

Two other points attracted the attention of your Committee. The first is, the announcement of an entirely new theory regarding the development of the teeth, having nothing in common with those heretofore advanced. Of the merits of this theory it is not proposed to offer an opinion, as the author gives no premises upon which he bases his conclusions. The second point is, the prominence which is given to so-called "vital" force, in connection with dental caries.

He says: "That the teeth in their formative state partake of the healthy or unhealthy condition of the system at large, all observers admit. But here, unfortunately, the matter has been left, most practitioners acting on the premise that such impressions are never to be altered. At such a conclusion it is impossible not to express surprise. Who, in his own person, or in the persons of friends, has not remarked the varying conditions of the health of the teeth? Up to the age of sixteen I was myself a martyr to toothache; yet about that period a change occurred, since which time I have had no trouble. Similar instances exist in profusion, and yet the lesson seems unheeded. There is a constitutional treatment for the carious tooth as there is for the carious maxilla, and from a common stand-point are the diseases of both to be viewed. * * * * Integrity of the teeth depends on two general conditions: inherent vital resistive power, and the absence of irritating influences. A tooth may, in its vital relations, be just strong

enough to resist external forces brought to bear against it, if in its construction there is no mechanical imperfection. It may, even with imperfections, be able to resist temporary injurious impressions. The vitality of a tooth can be elevated as the vitality of a lung is increased. The study of the vitality of a tooth, and the study of its adverse influences, is the study of vitality and the expression of irritation anywhere. The treatment of dental caries is both medicinal and operative.

This seems to be a more comprehensive view of the etiology of caries than generally appears in our text-books, and, your Committee think, more nearly approaches the truth regarding the matter. The remainder of the work is devoted to the diseases and surgical treatment of the oral cavity, exclusive of the teeth. This part of the work it has been impossible for your Committee to fairly review, but from what could be learned from early reviews of the book, and from the opinions expressed by leading members of the profession, the conclusion has been reached that although some of the doctrines advanced by the author might meet with severe criticism, the work as a whole will prove valuable as a practical guide in very many cases. Great credit certainly is due to the author for his endeavor to "bridge the gap which has always existed between General Surgery and Dentistry;" and that his efforts have been crowned with partial success, at least, there can be no doubt.

If the present edition fails to fully satisfy the demand, it is to be hoped and presumed that the author will at no very distant day issue another edition which shall supply all that is now wanting.

"The Pathology of the teeth, by Carl Wedl, Professor of Histology in the University of Vienna (translated by W. E. Boardman, M.D., with notes by T. B. Hitchcock, M.D., D.M.D.)"—

The report of this Committee offered at White Sulphur Springs two years ago, made some reference to the above-named work, prior to its translation. In addition to what was then said, your Committee cannot do better than to quote from the notice of the work by Dr. Judd, which appeared in the "Missouri Dental Journal" of November, 1872, as fully expressing the Committee's more matured judgment.

Dr. Judd says: "The work is upon a branch of study which has been too much neglected by the dental profession, and is of too

much importance to be passed over with a hasty notice. As regards its scientific character, it is probably equal to 'Tomes' Dental Surgery,' which has heretofore held a position which, in this respect, had been attained by no other work upon our specialty. One fact must be kept in mind in considering this work: It is not the work of a practical dentist, but he states that it was his endeavor 'invariably to keep in mind the requirements of the dentist,' and in many of the labors and experiments which were necessary for the accomplishment of the work he was assisted by dental practitioners.

"The first part of the work is devoted to anatomy and physiology principally. The histological characteristics of the teeth, gums, and periosteal structures receiving considerable attention, as well as their histogenetic peculiarities. The description of the development of the teeth is not so clear as Waldeyer's, though both quote from Tomes and Marcusen, as well as Kölliker and other authors, and in their principal points do not disagree very widely. Waldeyer, however, is much more prolix and minute in his description of this process than Wedl, though the latter, we think, is sufficiently explicit to serve his special purposes.

"In the second part the irregularities of the teeth receive the first attention. These are treated of under the heads of irregularities in size, number, arrangement, position and structure. Under the latter head, the influence of hereditary syphilis upon the structure of the teeth is discussed at considerable length.

"Inflammation of the pulp, gums, periosteal structures, and caries of the teeth, are treated with much care, and there is abundant evidence of study and investigation throughout the work. The scientific character of the work is in striking contrast with the majority of those which have heretofore appeared upon any subject immediately connected with the specialty of dentistry, whilst it is the only one which has been particularly devoted to the pathology of the teeth.

"The chapter upon the theory of caries, translated by Dr. Koch, of Chicago, we published several months since in this journal, and it can speak for itself as to the views of the author upon this subject. The chapter upon new formations is prolix and exhaustive, giving the most precise and reliable description of the dentinifications and ossifications of the dental pulp which we have met with. Exostoses

of the roots are also treated of with like ability. Cysts of the jaws, or, as they have been called, cystic tumors of the jaws, receive but little attention. They are rather rare, and little is known in relation to their cause, and the treatment of these cystic formations differs considerably among different practitioners. We have seen one clearly marked case in a child of three years.

"In speaking of the 'green deposit,' or green stain found upon the incisors, following the lunated margin of the gums, he says, it 'cannot be washed off in water, nor wiped off, but must be scraped off with a sharp knife, when the enamel will be found bright and intact.' He says, also, 'I have never observed a penetration of the green granular mass into the peripheral enamel layer.'

"This, we imagine, would not accord with the experience of most dental practitioners who have given this subject special attention. The author's explanation of the formation of tartar, which he states 'is formed in greater abundance upon the facial surface of the upper bicuspids and molars,' and which he accounts for by 'the fact that Steno's duct opens directly opposite the second BICUSPID,' will need some revision.

"The chapter upon the neuroses treats at length upon the causes of dental neuralgia; and some theories are propounded which will require more testimony in their favor than has yet been adduced, before they will be generally adopted by the profession — though upon this subject this author is much more philosophical, and we imagine much nearer correct, than Anstie, with his startling hypothesis regarding the atrophies of the spinal nerves. One point deserves special attention: He considers the extraction of teeth as a special exciting cause of neuralgia. Gross has reported several cases where severe neuralgias had their origin in the alveolar process when teeth had been extracted, and which were cured by cutting out the portion of the process where the pain originated. We can easily imagine that nerve fibers may be compressed by the contraction which takes place in cicatricial tissues, but these cases are undoubtedly rare. The author also says that, 'after the amputation of limbs, sensitive nerve-tubes sometimes grow in large numbers from the ends of the divided nerves,' and he thinks an analogous process may take place after the extraction of teeth which might produce a neuralgia. We are aware that neuromata also develop upon the ends of divided nerves, and give rise to neu-

ralgic affections; but the neuralgias arising from all of these causes are undoubtedly much less frequent than those which arise from the irritation produced by fangs and teeth, which are nearly or quite deprived of their vitality, remaining in the gums or in their sockets. Many interesting questions are discussed in this work, and generally with marked ability. It is well worth the attention of the profession, as it is by far the most valuable addition to our dental literature which has appeared for many years."

The annotations of Dr. Hitchcock are very brief, but valuable, and it is to be regretted that he did not make more of them.

"Dental Caries, and its Causes; an investigation into the influence of fungi in the destruction of the teeth. By Drs. Leber and Rottenstein (translated by Thomas H. Chandler, D.M.D.)"—

This is a work devoted to the endeavor to establish the fact of the prominent influence which Leptothrix Buccalis exerts in the destruction of the teeth in so-called caries. The work is very admirably written, and gives, undoubtedly, the results of an extended series of observations, but fails to establish anything more than the fact that leptothrix are invariably found in connection with carious dentine, and occupying the dentinal tubuli. The demonstration of its active influence in the process is wanting, but the results of these extended observations, so fairly stated as they seem to be, furnish much food for thought, and doubtless will stimulate other observers in this direction, until the question may, perhaps, ere long be definitely settled.

This work seems to attribute the so-called "green stain" to the leptothrix; but as the authors say they have made an examination of but one case of that character, their observations need to be largely extended, and corroborated by those of other observers, before we can accept this theory.

The descriptions of the appearance of the various changes in the tooth substance during the progress of caries is very clear, though not, perhaps, as good as Wedl's. The latter author, though acknowledging the presence of leptothrix, does not accord to it that influence which Leber and Rottenstein do. The illustrations in this work are very beautiful, furnishing some of the finest specimens of lithography to be found anywhere. This book, though failing to demonstrate fully its claim, must yet be held as a most

valuable contribution to our literature, and its views must command the respectful consideration of explorers in this field.

"Treatment and Prevention of Decay of the Teeth. A practical and popular treatise, by Robert Arthur, M.D., D.D.S."—

It will be impossible to give to the work bearing the above title, the full consideration which the importance of the subject it treats of really demands, but its chief features will be referred to. The work proposes, for our consideration, an entirely new system of practice, as regards decay of the teeth upon their proximal surfaces.

It looks chiefly to prevention, rather than to cure, and claims, briefly — that all the teeth can be preserved from decay upon their proximal surfaces by the practice of this system.

This method proposes the creation of artificial spaces between all the teeth, commencing with the eruption of the first permanent molars; which spaces, it is claimed, may be rendered permanent by giving them the proper shapes. Thus, for the incisors, the spaces are to be V-shaped, with the broadest end of the opening toward the lingual aspect; while for the bicuspids and molars they are to be shaped so that there will be a broad end toward the lingual aspect, and also a broad end at the grinding surface — constituting what is called the double V, or wedge-shaped space.

It is not proposed to discuss at any length the merits of this proposed system, but it may be briefly stated that there is no doubt that some more efficient means for preserving the teeth than any heretofore practiced, is earnestly desired by the profession, and any suggestions that lead in this direction will be gladly accepted by the profession at large. That Dr. Arthur's views are all sound, no one, perhaps, would at this time affirm, but that his plan is largely based upon philosophical grounds your Committee feel can be established. The testimony concerning the results of this method of treatment must necessarily, at the present time, be very meager, and for any evidence covering an extended period we must rely upon Dr. Arthur himself. Such testimony generally would not have very great weight, but there are some facts concerning his testimony which, perhaps, justify us in giving more than usual credence to the author of a new method, touching its experimental workings.

Dr. Arthur tells us that this system has been the growth of years of study and experiment in this direction, that he has been

practicing thus for the past twenty-five years, and that his experience has justified him in bringing before the public this as a new and improved method. We rarely have new things presented for our consideration in this way — claiming to be backed by any such testimony of experience — and so it must be allowed that Dr. Arthur's evidence challenges our respectful consideration in no ordinary degree.

As a literary or scientific work, the book is full of faults, but of these we do not propose to speak.

It is to be regretted that the work was published just as it was — addressed both to the public and the profession; for while it is very doubtful if it will be productive of any great good in its character of a popular treatise, it is, at the same time, very deficient as a text-book for the practitioner, as to the details of the proposed system.

It is very unfortunate in its tone when it refers to practitioners generally, and to the advantages or otherwise of generally followed modes of practice. The tendency of the work would be to lead the public at large to question the value of the services of any man in the profession except one, which effect was doubtless very far from what the author intended or desired.

Again, the work seems to place but a low estimate upon the qualifications necessary to fit a man for filling teeth quite well (page 208), while your Committee have come to think that the proper treating of even the simplest cavities requires a more than ordinary degree of skill.

Then, too, the author seems to consider that no special ability or skill is requisite in the pursuit of his method. He says (p. 154), "All the requisite operations are certainly within the capacity of dentists of very moderate ability."

Now, if these operations are to be performed successfully, the Committee are of the opinion that they require, on the part of the operator, a degree of skill much more than moderate.

But whatever the faults of the work, it may claim the merit of presenting to us a system which is founded upon seemingly reasonable premises, and it deserves at our hands the most careful consideration.

Mention will here be made of an article which was forwarded to the Committee, in response to their request, which was published

in the journals — the only response, by the way, which that request elicited; though the Committee have been informed, since the writing of this report, that at least two other books pertaining to our specialty have just issued from the press.

"Upon the Teething of Children. By Dr. Adolph Petermann, Frankfort-on-the-Main. An extract from a popular scientific lecture delivered December 14, 1871, in the 'Freien deutschen Hochstifft.'"

The above is the title of a well written article particularly addressed to mothers, and only commands our notice here as suggesting that possibly we have a duty in this same direction, from the observance of which much good might arise.

In concluding this report, your Committee feel that this Association, and the profession generally, have much to congratulate themselves upon, and still more to hope, from the exhibit here made regarding the productions of the past two years. There has been nothing occurring in the history of our profession so conclusively establishing the advancement of our calling toward that place of honor and repute among the professions which we hope and are destined to attain; and we should be stimulated thereby, each in his own sphere, to renewed efforts for the advancement and honor of our chosen calling.

REPORT

ON

DENTAL LITERATURE.

By E. A. BOGUE, of the Committee.

IN making a report on the magazine portion of Dental Literature, we shall endeavor to make such a summary that a more comprehensive idea may be had of this branch of the subject than we have been able elsewhere to obtain.

To begin with, there are 7,839 dentists in the United States, about 2,200 in Canada, and nearly 4,000 in Europe and the larger capitals elsewhere; a sum total of about 14,000, of whom 10,000 live in America. Unhappy Americans!

Among these 14,000 dentists there circulates a great number of periodicals of various degrees of excellence or otherwise. According to the best information we can obtain, 1 of these is in Italian, 2 in German, 1 in French, 1 in Swedish; 3 are published in England, and 4 in America.

Of these 12 prominent journals, 5 are independent of other commercial transactions —"The Vierteljahrsschrift," published in Germany; "The British Journal," "The Odontological Society's Transactions," and the "Monthly Review," published in England, and the "Missouri Journal," published in America — out west; while all the others, so far as known, are primarily maintained for the purpose of advertising some one's merchandise or practice, or school, and would at once be suspended were that object removed. There were certain other journals lately published, but we have to record the suspension during the year of three of these, of which two have been for many years established — "Der Zahnarzt," "The Philadelphia Dental Times," and "The Canada Journal of Dental Science."

On the other hand, there have been at least three new journals established — the "Correspondenz Blatt für Zahnärzte," in Germany, and the "Giornale di Corrispondenza pei Dentiste," for Italy, both published in Berlin, by Messrs. Ash & Sons, and the "Monthly Review of Dental Surgery," published in London. The "Vierteljahrsschrift für Zahnheilkundt," which is now in its thirteenth year, is the organ of the Central Association of German Dentists, and is a quarterly publication; it has assumed the work, and endeavors to fill the place, of "Der Zahnarzt," which was suspended at the end of its twenty-seventh year. This latter was a monthly publication.

The former publisher of "Der Zahnarzt" undertakes the publication of the German quarterly, at his publishing house in Leipsic, while Herr Baume, of Berlin, undertakes the editorial control, thus making it a purely literary venture on the part of the publisher, who is not otherwise interested in dental goods. This gives to Germany one thoroughly independent and high-toned journal which is the organ of an association somewhat like this one, and is sustained by its members.

The other German "Journal of Correspondence," as well as the Italian one of the same name, is published and managed, as before stated, by Messrs. Ash & Sons, of London, through their branch house in Berlin, who have, as a primary object in publishing these journals, the furnishing of a medium for their own advertisements of dental goods to be spread before the profession. The other new journal is published in London, and is an outgrowth of the feeling which is gradually permeating the minds of our Trans-Atlantic brethren, that freer and fuller discussion of matters connected with our specialty is essential to a rapid progress therein.

It will be noticed that the proceedings of the American Dental Association are not included in the list of periodicals, any more than the proceedings of the State societies: yet two of the journals mentioned — the German Quarterly and the Odontological Journal of Great Britain — are the organs and the record of the proceedings, each of a society, and are among the most valuable of the publications which are confined strictly to dental specialties.

To return now to the magazines of our own country — as has been already stated, the Philadelphia Dental Times and Canada Journal have been suspended; there remain to us the Missouri

Journal, The Cosmos, The Register, and the American Journal, as media of communication between the members of the profession.

With regard to the first-mentioned journal, it seems to be independent of all business interests that would overshadow or retard the positive advance in science, and knowledge of all useful kinds in our profession, including the knowledge of how and where to get, on the best possible terms, the materials needed for our work.

So far as the other three journals are concerned, they are apparently published with the design of causing their literary matter to carry the advertisements, which is the essential thing to their respective publishers.

One, at least, of these magazines declines to publish the advertisements of rival firms at any price; hence we are now threatened with the establishment of two more so-called dental journals, which will be published, if at all, primarily in the interest of manufacturers having wares to sell; and therefore cannot be expected, any more than those already established, to take the high professional ground that ought to be occupied by a scientific journal.

It is a noticeable fact that since the days of the old series of "The American Journal of Dental Science," dental literature in this country, as represented by the bulk of magazine articles, has been at a low ebb, many of the men of the highest ability and most extended experience having withdrawn themselves almost completely from contributions to our science through these vehicles.

It is a well-known fact that any dealer in dental goods, publishing a magazine, is liable to lose a customer if he declines to publish an article sent him, no matter how crude, illy constructed, or ungrammatical it may be. If the magazine is published by a college, conducted as most of those institutions now are, the fear of losing a student, or the influence of a former student, would be equally operative in case communications of a similar nature are rejected, and we cannot blame business men for conducting their business operations strictly with an eye to the largest pecuniary returns.

Turning now, for a moment, to the other side of this question, it cannot be denied that much labor and care have been expended to make these magazines worthy of being read, and to enhance their value as literary productions; but in the very nature of the case it has been impossible to produce the best results.

Very many gentlemen, capable of instructing us each in his own special department of study, decline to give their best efforts to any of these ephemeral publications, but furnish articles of sterling merit for the meetings of the various societies which are oftentimes copied far and wide; and it gives us pleasure, in this connection, to step out of our way to notice the published Proceedings of the Illinois and Iowa State Societies, which, within the last two years, have contained as much valuable original matter as, perhaps, all the magazines of this country put together.

The Missouri Journal has not feared to speak out truthfully and plainly in regard to several abuses — notably the hampering of discussion in regard to dental education, and the unfortunate position of our current literature.

It contains, during the year, about twenty articles that might be called scientific, of which nearly all are copied from sources not always accessible to the dentist. A few are original.

A large number of articles that may be called literary — such as descriptions of modes of practice, new instruments and appliances, the proceedings of societies, and the interchange of views, or guesses regarding certain questions that are under discussion — constitute the balance of its table of contents, which, by the way, is not at all well arranged for the student to know at a glance whether a given article is original or copied, or who is the author.

The "Cosmos" contains about ten scientific articles, of which one runs through the entire year; and twenty-three literary articles, all of which are original.

The table of contents of the "Cosmos" is admirably arranged, and one may know immediately whether an article with a given heading is original or copied from some other source, and if the source quoted from could be included, it would be a great assistance.

The "Register" is under its old editorial management, but it is now published by a firm of dealers in dental goods, as is also the "American Journal" of the new series. A few original articles of some value have appeared in these journals during the past year, but most of the more valuable contents of their pages, exclusive of the advertisements, have been copied from other publications.

The new "Monthly Review," of London, contains a large number of original articles, and is about equally divided between

scientific and literary matter. It seems to be thoroughly alive to the best interests of the profession; and while able to furnish a large share of its scientific articles from first hands, it draws freely upon both medical and dental publications in the United Kingdom, upon the Continent, and in America. It takes the highest stand in regard to dental education, and has less heavy gravity, or what might be called the dignity of dullness, than any foreign magazine of which we know.

A noticeable series of articles have been those upon Fletcher's fillings, including the reports of the committee appointed to examine into their merits, and involving inquiries into the whole series of oxychloride of zinc fillings.

The physiological researches of Mr. Tomes may, perhaps, be mentioned as being of great interest, and as showing the bearing of the doctrines of Darwin and Huxley upon the every-day matters of our work-day life.

The "British Journal" has continued the even tenor of its way, containing much that is useful, very much that is on a par with our own journals, and, in fact, with all other journals of our specialty which are published monthly — namely, much diffuseness.

One eminent service it renders each year — it lays before the practitioners and students the examination questions propounded at the College of Surgeons, both for admission and for graduation, so far as it is able; and by this publicity stimulates both teachers and pupils to higher and fresher attainments.

To sum all up, it is the opinion of your Committee that our magazine literature needs two things sadly; independence — the opportunity for free expression regardless of anything but the truth; and recognition by and co-operation with the medical journals already established, in whose columns a few of our number are already making themselves felt, and by so much enhancing the dignity of their profession.

We are of the opinion that a journal published, perhaps, quarterly, and managed by the dentists themselves, as the organ of a society, or of several societies, and published in the interests of the highest and best needs of the profession, would be a power for good, and would draw out a quality of support superior to that now accorded to the journals. Such a magazine could advocate a high standard for graduation to a degree, and not fear the with-

drawal of valuable patronage in case of a comparison between two rival schools; nay, it might advocate the closing up altogether of all but one or two of our schools, and the establishment of a board of examiners from the profession at large, who alone should have the power to grant degrees, and who, by their searching and impartial examinations, should make a degree worth more than the bare money cost of getting it.

DISCUSSIONS.

Dr. MORGAN: I have read the recent work of Dr. Arthur. I regard him as unreliable. For instance, on page 23, he says: "I would here say that I cannot be strictly accurate." Now I aver that no man can be relied upon who is not "strictly accurate." See page 103—he says: "A dentist who is worthy of the name should be able to recognize such cases (such as will not decay during the life of the patient), and to avoid unnecessary and injurious intermeddling with any of the teeth. I hold myself capable of making this discrimination." Who believes this can be true, under all the modifying circumstances of health, age, etc. etc. No man can do this. Again, on page 8, he says: "That the pain usually attending dental operations may be entirely avoided;" and for fear he may be misunderstood, he reiterates, on page 174, "But a very important feature of the method [his method] is that, by its adoption, all painful operations may be avoided." I am sure no one here believes this. His plates or cuts are objectionable and unfair, in that they do not represent any of the classes of teeth most difficult to treat by his method. For illustration, divide the teeth into five classes, beginning with those most perfectly formed, not one of his cuts would represent teeth of the 4th and 5th classes, those with long, large crowns and narrow necks. He says, on page 83, that children's teeth should be examined at *least* once a month, and should be pressed apart with tape to do so. In another place he says once a week. This is simply out of the question, for if a man had a score or so of children under his care, and should so proceed, he would do nothing else but press apart and examine.

On page 17, speaking of the enamel, he says: "These fibers are united by an intermediate substance, and the surface is smooth and polished." Now, we all know it is often rough, grooved, and pitted. This he contradicts before he gets to the bottom of the page. The fact is, the book is self-contradictory from beginning to end.

Dr. ATKINSON: We are not sufficiently advanced to pronounce so dogmatically as has been done in the work just referred to. This work seems to be a benevolent effort to make Tom, Dick, and Harry know the shortest time in which to do the most mischief. The appliances referred to in his book are unfit for use. The large discs that are thin enough require the mouth to be opened too wide. There is not one of them recommended by him but what is mischievous; and his own are execrable. It has been claimed here that Arkansas-stone can be made to reach every part of the tooth. I apprehend that no stiff body can be adapted to the surface at all points. Corundums are better than files.

Dr. THOMAS: Amid the general and wide-spread diffusion of dental science, the time has arrived to direct the public mind to something better than manipulative skill. Patients come into our offices expecting only to receive manipulative skill, and never think of consultation as to the best manner of preventing disease. Some time ago a committee was raised to solicit articles for distribution among the public, and to produce terse articles for the school-readers upon the care of the teeth, proper diet, etc. It seems to me that every patient ought to prize the valuable time we spend in explaining these points to them in the office high enough to pay for it. How many of us get actual fees for such advice? We must make the patients feel that it is valuable; we must guide them in regard to the prevention of disease. If we do this, the demand for manipulative skill will decrease. Let us look into this: I can remember when, a few years ago, I could not see the bearing of many things discussed at these associations; but I began to appreciate their value as my sphere of thought enlarged. We should have pamphlets published; better without any name. Let them be worthy, and I think they will be generally appreciated and acted upon.

Dr. HITCHCOCK: If the profession had journals which were not published in the interests of manufacturers and dealers in

dental goods, so that they could take an unbiased view on any subject, there would be one step gained. It is not State laws to regulate the practice of dentistry which is to advance our standing; it is thorough education. Until we increase in scientific culture, as a profession, we shall fail to receive that recognition which we talk about so much. We cannot get this by standing day after day at the chair; some time must be given to study. If we will not do this ourselves, do let us insist that those who are to follow us shall do it; that they shall acquire the habit of study and observation while they are young.

This cannot be done by attending one course at a dental college. Connected, as I am, with the Harvard school, I feel that I cannot speak without reflecting somewhat its views. I do strongly feel that the schools make a serious mistake, and one which they will feel some day, in allowing students to graduate after attending only one course. They must have had the same experience which we went through for three years. Where one person, who would be a credit to the school as a graduate, applied under the plan of allowing five years' practice to be considered as equivalent to one course of lectures, some eight or ten young men would come forward who had been "in practice" since they commenced to study — three or four years in all. Many, upon learning that five years only were accepted, said, "I will go home and practice another year, then I can get through in one term." Now, this is not only encouraging superficial education, but it is offering a premium upon it — one which can be reckoned in dollars and cents. When dental schools were first established there was perhaps some propriety in this provision, but that was many years ago; and have we been standing still since then?

It is under this provision that nearly all of the "irregularities" in granting degrees have occurred. The better men should take the lead in earnest encouragement of those schools which endeavor to advance the requirements; as a result, not only will others follow them, but all the colleges will feel the influence and receive an impulse which they cannot resist.

If the colleges will take the proper course, we shall soon have a better literature, and it will be better sustained. At present, the only journal we have, which is not controlled by a dental depot, is

the "Missouri Journal," and I am well pleased with its independence, and we ought to encourage it.

Dr. WRIGHT preferred terse articles in papers and pamphlets, for popular education. Referred to the plan, which he stated had originated with the "Missouri Dental Journal," of publishing the biographies and giving the likenesses of prominent dentists, and thought the plan a good one. Hoped to see the officers of the American Dental Association appear in this way.

Dr. STELLWAGEN: I am pleased to see an advancement, every day, in the profession; I am pleased to see that we are not so far behind as some would have us think. All the journals contain very valuable matter. I fear you are too easily dissatisfied, both by your colleges and your journals. But, let me tell you, crimination and recrimination do no good. Let each one determine to do all in his power to promote the interests of his profession. It will be years before we can talk of educating the public. We must educate ourselves — bring ourselves up to a standard of respect among our brethren of other professions. In Philadelphia there is no trouble on this ground; there is no invidious distinction between dentists and medical men. I have seen the highest respect shown to dentists by the first medical men in the country. They place their wives and children in the hands of the dentist, and meet on a level or not at all, thus throwing the entire responsibility upon the specialist. But the time has not yet come for uniting the two professions in one. Until the medical profession views the dentists in their true light we had better separate our journals and separate our schools. The day will come, and I hope to see it soon, when every man will be required to show his medical diploma before he is allowed to matriculate in a dental college. I am waiting patiently, but I am sure it must come.

I wish now to answer a remark in regard to the action of the Quebec Board, referred to in the paper just read. It has been too hasty in its action. It accuses the Philadelphia Dental College, and the Pennsylvania Dental College, of repeatedly violating their published requisitions. On consultation with Prof. Buckingham, I learn that in his school only three men have been received from Canada, but two of whom are living, and they are certainly worthy men. No man can pass through our college unless he is well qualified to do so. Out of the fifty-nine who presented themselves

for graduation last term, one was told that he could not come up for examination, on account of his having been addicted to bacchanalian revelings, and only forty-nine received degrees. We have always endeavored to elevate the profession. We do not ask for students unless they are of the right kind. At our last college commencement party, I was repeatedly taken by the hand and congratulated upon the material on which we had to work. "The profession cannot help advancing with such an elegant set of men coming on" was often remarked.

The dental colleges have accomplished what no other colleges have. One fourth of their students are from Europe. I defy you to show where any medical or scientific college has done this.

In conclusion, let me say that, so far as we know, the charges brought against our school by the Quebec Board, are wrong. I have a copy of a letter written in reply to these charges, which was sent, that I would like to read. [By permission the letter was read.]

Dr. TAFT: I never imagined that this subject was quite so elastic as to be converted into special pleading. Our discussions should not take this course, nor should they, on the other hand, enter into condemnation of enterprises in the manner which has characterized the present discussion. While it is worth while to examine our literature as to its ability, it does not seem proper to enter into such a tirade of condemnation. It is very easy to criticise. Certainly the journals fall very far below what we would have them to be; but have they the proper support of the profession? As to the articles contained in the journals, one may be of very great value to one man, though not to another. Let us bid them God-speed. Because all the articles are not of the highest order, it does not follow that they will not be of service to anybody. In regard to publishing biographies, the "American Journal" began that years ago. It is by no means a new thing. In reference to the subsidizing of the journals to commercial interests, this must be taken with a few grains of allowance. I insist upon it that this wholesale denunciation is out of place. Let us walk shoulder to shoulder, man to man. All the journals are doing all they can. The "Dental Cosmos" is a very valuable journal. The "Dental Register" is doing all in its power to advance the interests of the profession. It is true they are published by men who

sell dental goods; but that has nothing to do with the articles which appear in them. I do not think our journals should be throttled in this manner. In regard to Dr. Arthur's work, I think Dr. Morgan's criticism a just one, and also Dr. Atkinson's. In regard to the doctrines taught, I think that, so far as a practice is predicated on these principles, it will be wrong. Books should be very careful in what they say, as they are to go before students.

Dr. HERRIOTT thought the journals were not supported by the profession as they ought to be. He said that he had recommended the employment of a reporter by all the societies, and the sending of the proceedings to the journals. They would be of great benefit to those who could not attend.

Dr. TAFT said that it was an up-and-down business with the editor. At one time a man would come in and say, "What in the world did you publish such an article for?" And just after, another would come to thank him for it, and say it was the best thing he had ever seen.

Dr. JUDD said that he had nothing to say, one way or the other, on the question, but would simply remark that he regarded this discussion as an outcrop of public opinion. The same thing had occurred in medical circles twenty years ago, and it wrought a good influence on medical literature. He had tried to find something in the medical journals to criticise, but had failed. It was not so with the dental journals. He did not believe they could have a first-class literature until it was perfectly independent. It is not so much so now as the literature of the medical profession.

Dr. WRIGHT said he had no disposition to go back on the "Register" — he couldn't do without it.

REPORT

ON

MECHANICAL DENTISTRY.

By W. M. HERRIOTT, of the Committee.

I BELIEVE that the object of a standing committee upon Mechanical Dentistry, in an organization of the character of the American Dental Association, should be to advance the interests of the profession by discharging the duties indicated by the name given to the committee.

To fully realize the great importance of this branch of our profession we must comprehend the magnitude of the necessities of those who are looking to us for relief from their embarrassed condition, caused by the loss of the teeth. I, one year ago, asserted the fact that more money was paid by the people of America for artificial dentures than was paid for filling teeth; this was discredited by some, but is acknowledged by all who take the trouble to learn the facts.

Now, as this is true, should this very important part of the field which we have undertaken to cultivate in the interests of humanity be neglected? That it has been by the leading members of Dental Societies no one will question, and it is also evident that our journals have not received that support by us that they needed to assist them in carrying that power with them, as teachers, that they would desire as to this half of our profession.

It was asserted by a member of this Association, at its meeting in 1864 — one who stands high as a journalist, and a professor in one of our best dental schools — that too much importance was attached to Mechanical Dentistry, and too little to preserving natural teeth. However true this may have been then, it is not true now.

Bases for artificial teeth long in use, I will not stop to refer to. To those of more recent date only will I give attention. Among these we find an alloy of tin and bismuth, which, if united in the oxides in the proper proportions, so as to make a chemical compound — not a mechanical mixture as when united in a metallic state — gives us that which is as pure as a single metal, and, when properly constructed, gives us an artificial denture, strong, pure in the mouth, and quite comfortable to the patient when weight is not an objection. Later, we have had offered for our uses celluloid — a composition of strong hemp fiber, gum camphor and coloring matter, nothing more. The inconveniences to the operator in using this base have been overcome by the manufacturers, who are giving us plates which become softer at the degree of heat to which we can subject them, which obviates the danger of breaking teeth and models. A denture, when this base is used, and care is taken to grind the blocks so that they will be nicely joined together, has the appearance of continuous gum or porcelain work. Celluloid being quite strong, a plate of it can be made thinner than rubber; and this, with its being a better conductor of heat, allows the mouth to experience the thermal changes which appear to be necessary to keep it in its normal condition.

Quite recently gutta-percha has made its appearance in a vulcanizable form, and has the advantage over other vulcanites, of being more easily flasked, has no unpleasant odor, and does not appear in the joints.

The elective course in the selection of that material which would be best suited to each particular case, is not enough practiced by many operators. We should study well all the requirements of our patients, and select as a base that which would be best suited to his or her mouth, as each form of base used has qualities differing from the others in as great varieties as we find of materials used. The dentist who would by his practice say that all mouths were alike, and would insert teeth upon rubber, or even gold, for every case, and say that that was the best way to operate, is as much to be condemned or pitied as the physician who would call all diseases fever, and would prescribe calomel alone, and would insist upon that as the best, the surest mode of practice.

The teeth, the most important part of an artificial denture, we

will next consider; most important, because their form and strength give the beauty and efficiency to the entire structure. And as the manufacture of teeth has gone from the dentist into the hands of those who make, but do not mount teeth, that advancement has not been made that might have been; still, it is with great pleasure we notice the gradual improvements made by the truly skilled manufacturer, the one who puts brains with money into his business, whose taste and time are expended in developing and improving upon suggestions thrown out by the dentist, who is truly a liberal artist. This one we should support in all ways within our power, for he is with us a pioneer in this great profession.

The only artificial teeth we have found practical are those made by moulding porcelain upon pins of platinum; but we have found great trouble from the pins drawing from the porcelain by the retractive forces to which the teeth are subjected; but this weakness has been overcome perfectly by the use of the up-set foot-shaped pin found in the teeth now manufactured by S. S. White.

The practice of so many, of making so called temporary teeth, is bad in practice. A set of teeth, whether they be a first or second set for the same patient, should be called a set of teeth, and should be charged for in proportion to time and skill necessary for their construction. Also, let me, in conclusion, say that all operations of the dentist should be charged for in such a way that he will be fully remunerated for his success in supplying the wants of his patients, whether he fill a tooth or make a set of artificial teeth; he should not make his fee in proportion to the number of teeth inserted, but in accordance with the time and skill necessary to make a complete operation; and it will only be by this mode of practice being adopted that we will hold Mechanical Dentistry up to a proper standard, and prevent it from becoming a trade to be practiced by inefficient operators. Does not humanity demand something better from us?

REPORT

ON

MECHANICAL DENTISTRY.

By W. H. EAMES, of the Committee.

AS one of the members of your Committee on "Mechanical Dentistry," I beg leave to offer a few thoughts and suggestions on the present and future status of this branch of dental art. Before entering upon the subject to which I desire specially to call your attention, I will pause to notice a material (not mentioned in the report just read) which is now being introduced in a new form, and with a new method of manipulation. I refer to Dr. McClelland's "Rose Pearl Base." Improvements have been made in the manufacture and mode of working this material, which it is claimed entirely overcomes the objections heretofore urged against it. It is now moulded into plates, similar in form and appearance to the celluloid and coralline bases.

To construct a plate, the teeth are arranged in substantially the same manner as for any of the plastic bases. Lead or tin is used for the base or trial-plate, covering only the palatine portion of the model, wax being used for the remaining portions. When the teeth are arranged on the base plate it is placed upon a metallic model, the wax is then removed from the outside of the teeth and plaster substituted; when this is set, the wax upon the inner side is removed and plaster substituted in like manner. When hard, the plaster is carved the same as wax would be for a similar case on rubber. A sectional metallic mould is then obtained of the entire case; plaster and base plate are removed and the teeth and moulded plate placed in this mould, heated to 280° Fahr. in a bath of spermaceti, when it is pressed into the required form.

The time and labor necessary for constructing a plate of this base is about the same as required for rubber. Plain teeth alone are used for this work. The material approaches so nearly the color of the natural gum that the use of gum teeth is seldom necessary. Of the durability of this material I cannot speak. Judging from the specimens I have seen and tried, I am favorably impressed with it.

An improvement has been made in the form of teeth adapted for this and rubber work, by which the liability of the inner cusps of bicuspids and molars to break down, when ground down near the shoulder, is overcome. It consists of a fillet placed in the angle of the shoulder formed for the reception of the material, which supports the cusp. The lingual surface of the teeth has been changed so that the material of the base does not come down upon them as far as with the old forms.

Of the present status of mechanical dentistry, I regret to say that while rapid strides in advance have been making in the departments of surgical and operative dentistry, the so-called mechanical branch has been retrograding and losing caste, notwithstanding the urgent appeals which have been made in its behalf from year to year, by your Committee and others, who, recognizing its importance, felt that it was becoming a reproach.

Many of you, gentlemen, as well as myself, have noticed the gradual change which has taken place in the relative importance and standing of this and the operative and surgical departments. The time has been, when the men who stood highest in the profession, and who were recognized as the best operators, were among the best plate workmen.

Good mechanical dentists (an appropriate term) were as common then as good operators and scientific dentists are to-day. The standing and ability of the dentist then was as dependent on his ability to construct a good set of artificial teeth, as it now is on his scientific attainments and ability to save the natural ones.

Then, mechanical geniuses were selected as fit subjects to make dentists of; now, intellect is looked upon as an important requisite in a dental student. Then thousands of dollars were expended for artificial teeth, while a comparatively small amount was paid in the attempt to save the natural ones. Then the time and attention of the dentist and student was mainly devoted to

this branch; now but few among operators or students can be found to do it homage. At one time it occupied a *prominent* position in this and similar associations; now it is almost ignored.

Gentlemen, if these statements are true, is it difficult to see what the final result *must* be?

The entire separation of this branch from the remaining branches is inevitable, unless something is done to awaken new interest in it.

Judging from the past, I do *not think* this is possible, and, therefore would suggest the propriety of our dental colleges striking it from their curriculums for the degree of D. D. S. I do not wish to be understood as advocating turning it out-of-doors, by any means — but I would not have the degree of D. D. S. dependent in any degree upon a knowledge of what is termed "Mechanical Dentistry;" I would have it taught, and our students should have the same facilities they now have for obtaining a knowledge of it; and, should they prefer to spend their time in this department, after passing a satisfactory examination, they should receive a certificate or diploma granting an appropriate degree — say, Dental Mechanician. The student who preferred to spend the time of his pupilage in other departments, omitting this, should be allowed the privilege.

Those of you who have been engaged in the instruction of dental students the past few years, will recognize the advantage gained by this step.

It is a common thing, at the present day, for dental students to object to spending the necessary time in this department to properly qualify them for graduation, as they do not intend to practice it; and if they fulfill all other requirements and pass a good examination before other chairs, no Faculty could well deny them a degree; and what is the result? The teacher of mechanical dentistry must sign a certificate which he knows to be false.

I am aware that there will be many objectors to this proposition; but, gentlemen, I feel satisfied that this will be the final result; it is only a question of time, and the sooner the change is made, the better.

Mechanical dentistry is fast becoming a highway for all the quacks, charlatans and butchers that desire to enter the profession.

They have but to enter a kindred shop, and be taught the mys-

teries of putting up a rubber plate, and then are privileged to go forth and proclaim themselves "dentists," and having secured a few patrons and friends they are recognized by the profession and community as such, and are dubbed "Dr."

Let the public once understand that we, as a profession, do not recognize the mere mechanic as a dentist, and that they are not entitled to the title of Dr., and we should soon put a stop to many of the evils of which we now complain. Some may think it all-important that a student should understand this branch, if he does *not* intend to practice it. I cannot see the importance.

Can a dentist diagnose a case better for this knowledge? Can he make a better prognosis for knowing how to construct a set of artificial teeth? Can he fill a tooth or perform any surgical operation about the mouth with more skill? If so, the surgeon should be required to become efficient in mechanical dentistry, and the manufacture of artificial limbs, before receiving his degree.

The maker of artificial teeth will one day occupy the same relation to the dentist that the manufacturer of wooden legs now does to the surgeon.

Report on Etiology.

By SENECA B. BROWN, of the Committee.

In presenting this brief report on Etiology, other diseases of the dental organs than decay or caries of the teeth will not be considered. From the earliest investigators to the present time, the theories advanced have been about as numerous as the writers on the subject. Former committees, in making their reports upon this subject, have given the names of writers in their order, with what credit the present light seemed to entitle them to. The theory now generally accepted as the primary cause admits of much further investigation into its precise nature and mode of action. Only by its comprehension can hygienic influences be exerted to a satisfactory extent. That defective organization of the tooth structure affords a more ready lodgment for the destroying agents is without question. That deficient elements can be supplied is a generally-accepted fact, and an achievement upon which the dental practitioner of to-day may well congratulate himself.

However, in the best developed and nourished dental structure, we find an agent to which the tooth must inevitably succumb. This agent is now generally accepted as a chemical one — an acid condition. More than a quarter of a century ago, ideas that an agent of a parasitic nature entered into the destruction of the teeth were promulgated. Until recently, nothing has been presented that commanded, to any extent, the attention of the dental profession. Since the report of last year, a work entitled "Dental Caries and its Causes," the researches of Drs. Leber and Rottenstein, has been translated into our own language by Thomas H. Chandler, D. M. D.,— this being an "investigation into the influence of fungi in the destruction of the teeth;" and the deductions in support of the theory appear in the chapter here quoted:

"We have already several times remarked that the action of

acids alone does not account for all the phenomena which appear in caries of the teeth.

"It is true that acids, even very much diluted, can attack the dental tissues; but we find, in their mode of action, differences which distinguish them from the phenomena and from the progress of dental caries.

"The acids attack first the enamel, and rapidly change it to a chalky mass; later, only, their action is felt in a marked manner upon the dentine, which becomes more transparent, and, in fine, as if cartilaginous, by the very slow, but progressive, loss of its calcareous salts. Caries, on the contrary, proceeds slowly in the enamel; it is much swifter in the dentine, where it proceeds promptly along the canaliculi. This difference of progress must be attributed to the participation of the fungi in the work of the caries. The elements of the fungi glide easily into the interior of the canaliculi, which they dilate, and thus favor the passage of the acids into the deeper parts. These same elements cannot penetrate a compact enamel; or, at least, they enter more slowly, and only when the elements which form it have been greatly changed by the action of acids.

"Leptothrix is found almost constantly in the buccal cavity, if great care is not taken to rinse the mouth frequently. Mr. Bowditch, in examining forty persons of different professions, and living different kinds of lives, found, in almost all, vegetable and animal parasites. Those only were found to be free who cleansed their teeth several times a day, and at least once with soap. The parasites were numerous in proportion to the neglect of cleanliness. The means ordinarily employed to clean the teeth had no effect upon these parasites, whilst soap appeared to destroy them. M. Kölliker, out of twenty or thirty young and well persons, found hardly one the papillæ of whose tongue was free from a grayish and granular coating; he, more rarely, met with filaments of the fungus. It is true that regard must be had to the hour of the day at which the examinations were made. It is natural that all these matters should always be more abundant when the individual is fasting. But while, in ordinary circumstances, the fungi are found only at the surface of the buccal cavity, they are seen to penetrate into the interior of teeth during the progress of caries. For them to be able to penetrate thus, it is necessary that the teeth be in

a suitable condition; the enamel and the dentine must have lost their density by the action of acids. It seems that the fungi are not able to penetrate an enamel of normal consistency. The dentine itself, in its normal condition of density, offers great difficulties to their entrance, and we are not yet sure that the leptothrix could triumph over this resistance. We do not speak here of the greenish deposit found upon teeth, which differs from caries, and upon which we have not yet sufficiently experimented. It may happen that, under favor of this deposit, fungi may penetrate into the superficial layers of the enamel, which does not appear to be the case in ordinary caries. Habitually the teeth expose to the action of injurious agents only their crowns, covered with enamel, and this protects them from the attacks of the fungus. We cannot decide, at present, if the leptothrix is able to penetrate sound dentine when, from any abnormal circumstance, it happens to be denuded. But, if the enamel or the dentine has become less resistant, at any point, through the action of acids, or if, at the surface of the dentine, a loss of substance has occurred, then the elements of the fungus can pass into the interior of the dental tissues, and produce, by their extension, especially in the dentine, effects of softening and destruction much more rapid than the action of acids alone is able to accomplish. The participation of fungus is constant in the progress of caries which has reached this stage. As soon as a loss of substance can be shown, there is found the presence of the fungus, so that the question whether or no the acids alone could produce ravages more considerable is without importance. But, in the early stage, when the surface of the tooth is still polished and intact, we have never been able to prove the presence of the fungus. It appears, therefore, that at this stage of the malady, which constitutes the dry caries, properly so called, all the disorders must be attributed to the sole action of acids. The development of the fungus seems to be favored by a neutral, or slightly acid, medium, whilst it cannot flourish in a strongly alkaline liquid.

"We have already called attention to the observation of Dr. Bowditch, who has seen the parasites disappear upon rinsing the mouth with a solution of soap. M. A. Vogel found that the fungus, *oidium albicans*, continued to develop in pure water, in solutions of salt without alkaline reaction, and especially in solutions of sugar; whilst no proliferations could take place in solutions slightly alka-

line. These observations, to judge of them by analogy, seem likewise to prove that alkaline liquids may exercise a destructive action upon the leptothrix."

Attaching to these investigations the importance which they seem, beyond doubt, to merit, may we not with profit give this theory our thoughtful consideration?

After the reading of the above report—

Dr. JUDD said: Any theory of caries that does not give attention to parasitic growth is worthless. It is an interesting study to find out what is fatal to these growths. There are a good many agents which instantly destroy the common forms, as those of stagnant water. Alkaline solutions destroy them at once. A great deal might be accomplished by a proper investigation on this point. That "green stain" is of parasitic origin, I have no doubt. Carbolic acid seems to exert a very deleterious influence on these growths, and when applied to children's teeth, covered with various kinds of deposits, it restores them to a healthy condition, and, I have no doubt, acts by destroying parasitic growth.

Dr. WM. C. EASTLACK, having been called upon for a statement concerning the practice of dentistry in China, responded as follows: You must not expect me to bring you anything new or fresh in dentistry. I can only bring you my personal experience of the practice in China and Japan. I was in Hong Kong for fifteen years. This is a British colonial dependency. I was confronted by a total want of appreciation of dentistry. My experience has been largely the same as yours. I have had for my patients, princes and slaves, Chinese, Siamese, Mohammedans, Turks, Greeks, Austrians, Tartars, representatives from almost every nation. Apart from this, my practice is identical with your own. I might give a very interesting account of my interview with the prince of the country, but this would take up too much of your time. When I went there to practice I was entirely dependent upon my own resources. I built my own chair. All my instruments were manufactured by myself. My patients came to me with marvelous tales of how the Chinese extract teeth without pain. They said they could take out five or six without giving any pain. I determined to investigate the matter. For this pur-

pose I went to Canton. I found them a set of charlatans, mountebanks, and sorcerers, who worked on the credulity and ignorance of the people, and, I am ashamed to say it, there were Europeans who believed in them and submitted to their operations. I endeavored to discover some of their tricks. I found the dentist under a large umbrella, with teeth strung around his neck. This was called the Temple of Horrors. Figures in life-size were hung around, represented as being torn in pieces, boiled in oil, etc. The dentist received me very kindly. I secured some of the white powder which he said was necessary to put around the tooth, after which the patient coughed, and the tooth came out in his hand. The powder was said to be extracted from the sweat of a horse, but on examination I found it to be arsenic. Their method of curing the tootache is by "extracting the worm," as they say. A gentleman told me he saw the worm in the tooth. They contend that, after penetrating, the worm attacks the blood-vessels. The operation in this case almost defied detection; but I stole the instrument with which he worked, which was a common pair of dissecting forceps, apparently, with which he brought out the black maggot and held it up. One of the arms of these forceps was made of bamboo, painted just like the other arm. On compressing this the worm came out. The instrument was placed in the mouth, the worm forced out, and then the forceps reintroduced and the worm taken away. This is the way they influence the natives, and I am sorry to say Europeans are often duped by them. They also make artificial teeth from the tusk of the hippopotamus, carved to a resemblance of the natural teeth, through which they drill holes, and attach to the teeth with copper wire. In Japan, dentistry is more of a science. Doctors and dentists there are nearly worshiped. In Yeddo, I saw a man carve out of hard wood, like mahogany, a plate to fit the roof of the mouth, and in this he inserted human teeth. The work reflected great credit upon his ingenuity. The teeth of the Chinese are very superior. They are finer and more durable than ours. Their diet is cleansing in itself. The Japanese are a most cleanly people. They use tooth-brushes made of willow, cut like a tooth-pick. They do not fill teeth.

I have two students,— one I took to Berlin and one to Philadelphia. They make fine operators. The artificial teeth made by a goldsmith there you would be surprised to see. Caries is not very prevalent. They use very little confectionery or sugar.

LOCAL SOCIETIES.

The Committee on Local Societies made the following verbal reports:

Dr. JUDD said that he had not, as a member of that committee, visited local societies to any great extent. As far as he was acquainted with the doings of these societies in the West and Northwest, they were progressive, and some of them were fully up to the standard of the present body, as their published transactions would testify. He thought it the duty of the Committee to search out and visit those societies which were the most benighted, and stimulate and assist their efforts to gain a more thorough knowledge of their profession. With this view, he had faithfully attended the meetings of the Illinois State Society ever since its organization, and began to entertain hopes of its enlightenment.

Dr. TAFT said that he had visited some twenty-four societies during the last year. He was glad to see them working so harmoniously, and he reported a great progress in almost every instance. He thought these visits should be kept up — they stimulated the local societies to work. Some of them so appreciated them as to pay Dr. Palmer's expenses to come among them to operate for their instruction. Dr. Atkinson, he said, was doing a great work in this direction. The pleasure that it gave the societies to receive their visiting brethren, fully repaid them for going.

Dr. ATKINSON said: My intercourse among the various societies has been very pleasant, especially in the South. There they fight and quarrel, and say I'm wrong, and all that; but when I convict them they are convicted all over. They are honest, and when they give up it's all over, and they go to work on what they have learned. But these New England fellows are hard to convict. They think they are the "hub," you know, and when you show them the truth they say, "that's so," and all that, but they are only convicted on the surface. If you go back to them after awhile, you'll find them sunk right in the old ruts again. Dentistry is moving on. Men are getting clear, and I hold that we, to-day, are the highest representatives of scientific progress on earth.

1874.

TRANSACTIONS

OF THE

American Dental Association

AT ITS

FOURTEENTH ANNUAL SESSION,

HELD AT DETROIT, MICH.

August 4th, 5th, 6th and 7th, 1874.

PUBLICATION COMMITTEE:

C. STODDARD SMITH, L. D. SHEPARD, A. H. BROCKWAY.

SPRINGFIELD, ILLS.
BEN. A. RICHARDS, PRINTER.
1875.

DISCLAIMER.

The American Dental Association, although formally accepting and publishing the reports of the various Standing Committees, and the essays read before the Association, holds itself wholly irresponsible for the opinions, theories, or criticisms therein contained, except when otherwise decided by special resolution.— *Constitution.*

OFFICERS, 1873-74.

PRESIDENT.

T. L. BUCKINGHAM, ... PHILADELPHIA.

FIRST VICE-PRESIDENT.

ISAIAH FORBES, ... ST. LOUIS.

SECOND VICE-PRESIDENT.

A. F. McLAIN, ... NEW ORLEANS.

CORRESPONDING SECRETARY.

J. TAFT, ... CINCINNATI.

RECORDING SECRETARY.

M. S. DEAN, ... CHICAGO.

TREASURER.

W. H. GODDARD, ... LOUISVILLE.

EXECUTIVE COMMITTEE.

G. H. CUSHING,	A. B. ROBBINS,	G. B. McDONNELD,
S. B. PALMER,	GEO. L. FIELD,	G. R. THOMAS,
L. D. SHEPARD,	H. A. SMITH,	S. H. McCALL.

OFFICERS, 1874-75.

PRESIDENT.

M. S. DEAN, ... Chicago.

FIRST VICE-PRESIDENT.

G. W. KEELY, ... Oxford, O.

SECOND VICE-PRESIDENT.

J. S. KNAPP, ... New Orleans.

CORRESPONDING SECRETARY.

G. L. FIELD, ... Detroit.

RECORDING SECRETARY.

C. STODDARD SMITH, . . . Springfield, Ills.

TREASURER.

W. H. GODDARD, ... Louisville, Ky.

EXECUTIVE COMMITTEE.

G. H. Cushing,	G. R. Thomas,	A. H. Brockway,
L. D. Shepard,	H. A. Smith,	G. C. Daboll,
Geo. L. Field,	S.H. McCall,	S. B. Palmer,

CONTENTS.

MINUTES OF THE SECRETARY.

Roll Call, - - - - - - - - - - - - - - - 9
Adoption of Amendment to Art. III, Constitution, - - - - 12
Adoption of amendment Art. II, Code of Ethics, - - - - - 13
Re-adoption of rescinded resolution as to arrears of dues, - - - 13
Report of Committee on Credentials, - - - - - - - - 14
Barnum Testimonial Fund—report of committee, - - - - 15–25
Resolution as to notifying members in arrears, - - - - - 16
Amendment to Art. IV, Constitution—notice of, - - - - . - 16
Report of committee on appointment of dentists in army and navy - 17
Resolutions on the death of Prof. Hitchcock, - - - - . - 18–87
Selection of place of next meeting, - - - - - - - - - 19
Election of officers, - - - - - - - - - - - 19
Proposed amendments to Art. IV and V, Constitution, - - - 19
Treasurer's report, - . - - - - - - - - - - 20
Report of Auditing Committee, - - - - - - - - - 20
Resolution in reference to payment of orders on Treasury, - 21, 22, 26
Resolution of thanks to S. S. White, - - - - - - - - 21
Resolution in reference to degrees, - - - - - - - - 21
Proposed amendment to Art. V, Constitution, - - - - - - 22
Resolution of thanks—Reporters, Hotels, &c., - - - - - - 22
Resolutions regarding copies of Transactions on hand, - - - 22
Standing Committees, - - - - - - - - - - - 23
Resolutions on Dental Education—Dr. Bogue, - - - - - 23
Resolutions on Dental Education—Dr. Judd, - - - - - - 23
Report of committee on rubber question - - - - - - - 24
Resolution of thanks to Michigan S. D. P. Union - - - - - 24
Proposed amendment to Art. III, Constitution - - - - - - 24
Report of publication committee - - - - - - - - 24
Resolution authorizing publication of Transactions - - - 25
Report of Committee to prepare a popular circular - - - 25
Proposed amendment to Art. VII, Constitution - - - - - 26

REPORTS OF COMMITTEES AND VOLUNTEER ESSAYS.

Report on Dental Physiology—M. S. Dean, - - - - - - 29
Absorption of roots of Deciduous teeth—J. H. McQuillen, - - 39

Pathology—Diseases of Enamel—H. S. Chase, - - - - - - 56
Report on Dental Chemistry—H. A. Smith, - - - - - 75
Report on Operative Dentistry—L. D. Shepard, - - - - - 89
Report on Dental Etiology—J. H. McQuillen, - - - - - 137
Report on Dental Etiology—M. H. Webb, - - - - - - 145
Report on Dental Education—A. F. McLain, - - - - - - 153
Report on Dental Education—G. W. Keely, - - - - - - 159
Report on Mechanical Dentistry—E. D. Swain, - - - - - - 185
Report of Committee on Appliances, - - - - - - - - 191
Volunteer Essay on Asphyxia—J. Douglass, - - - - - - 195

DISCUSSIONS.

Dental Physiology—Discussed by
Dr. McQuillen, - - - - - - - - - - - - - 37
Dr. Atkinson, - - - - - - - - - - - - - 49
Dr. Knapp, - - - - - - - - - - - - - - 52
Dr. Judd, - - - - - - - - - - - - - - 53
Dental Pathology—Discussed by
Dr. Atkinson, - - - - - - - - - - - - - 59
Dr. Judd, - - - - - - - - - - - - - 60, 73
Dr. Bogue, - - - - - - - - - - - - - 62
Dr. Morgan, - - - - - - - - - - - - 63, 72
Dr. Taft, - - - - - - - - - - - - - - 64
Dr. Spellman, - - - - - - - - - - - - 70
Dr. Watt, - - - - - - - - - - - - - - 71
Operative Dentistry—Discussed by
Dr. Southworth, - - - - - - - - - - - - 101
Dr. Crouse, - - - - - - - - - - - - - - 101
Dr. Morgan, - - - - - - - - - - - - - 102
Dr. Wetherbee, - - - - - - - - - - - - - 103
Dr. Shepard, - - - - - - - - - - - - - 103
Dr. Thomas, - - - - - - - - - - - - - - 105
Dr. Butler, - - - - - - - - - - - - - 107
Dr. Knapp, - - - - - - - - - - - - 108, 125
Dr. John Allen, - - - - - - - - - - - - 110
Dr. Keely, - - - - - - - - - - - - - - 111
Dr. Kulp, - - - - - - - - - - - - - - 111
Dr. Rehwinkel, - - - - - - - - - - - 112, 132
Dr. Stockton, - - - - - - - - - - - - - 114
Dr. Osmond, - - - - - - - - - - - - - - 115
Dr. Bogue, - - - - - - - - - - - - - - 115
Dr. Judd, - - - - - - - - - - - - - - - 116
Dr. Shepard, - - - - - - - - - - - - - 119
Dr. McQuillen, - - - - - - - - - - - - - 120
Dr. Allport, - - - - - - - - - - - - - 120
Dr. Palmer, - - - - - - - - - - - - - - 123

OPERATIVE DENTISTRY—Discussed by
Dr. Walker, - - - - - - - - - - - - - 124
Dr. Atkinson, - - - - - - - - - - - - - 126
Dr. Webb, - - - - - - - - - - - - - 128
Dr. Taft, - - - - - - - - - - - - - 129
Dr. Thomas, - - - - - - - - - - - - - 131
Dr. Cushing—Correspondence with Dr. Allport, - - - - 133
DENTAL ETIOLOGY—Discussed by
Dr. Noel, - - - - - - - - - - - - - 151
DENTAL EDUCATION—Discussed by
Dr. John Allen, - - - - - - - - - - - - 165
Dr. Walker, - - - - - - - - - - - - - 166
Dr. Taft, - - - - - - - - - - - - - - 166
Dr. Thomas, - - - - - - - - - - - - - 167
Dr. Stockton, - - - - - - - - - - - - - 168
Dr. Bogue, - - - - - - - - - - - - - 168
Dr. Butler, - - - - - - - - - - - - - 169
Dr. Allport, - - - - - - - - - - - - - 169
Dr. Morgan, - - - - - - - - - - - - - 170
Dr. Wetherbee, - - - - - - - - - - - - 171
Dr. McQuillen, - - - - - - - - - - - - 172
Dr. Crouse, - - - - - - - - - - - - - 174
Dr. Atkinson, - - - - - - - - - - - - 176
Dr. Osmond, - - - - - - - - - - - - - 179
Dr. Watt, - - - - - - - - - - - - - 180
Dr. Rehwinkel, - - - - - - - - - - - - 181
Dr. Horton, - - - - - - - - - - - - - 182
Dr. Judd, - - - - - - - - - - - - - 183

MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION.

By M. S. DEAN, Secretary.

THE AMERICAN DENTAL ASSOCIATION commenced its Fourteenth Annual Session in St. Andrew's Hall, Detroit, Michigan, August 4th, 1874, at 10:45 A. M.; the President, Prof. T. L. BUCKINGHAM, in the chair.

The session was opened with prayer by the REV. L. P. MERCER, of Detroit.

The roll of permanent members was called. The following members were reported as having paid their dues, those marked with an * not being present, but forwarding their dues.

W. W. ALLPORT,	669 Wabash-ave., Chicago.
*WM. H. ALLEN,	18 West 11th st., N. Y.
JOHN ALLEN,	314 5th-ave., N. Y.
C. F. ALLAN,	Newburg, N. Y.
H. L. AMBLER,	114 Euclid-ave., Cleveland, O.
*J. J. ANDERSON,	Springfield, Mass.
W. H. ATKINSON,	41 East 9th st., N. Y.
J. M. AUSTIN,	76 Felix st., St. Joseph, Mo.
C. M. BAILEY,	Machias, Me.
*J. W. BAXTER,	Vevay, Ind.
*C. H. BIDDLE,	133 Pacific st., Brooklyn, N. Y.
*J. J. BIRGE,	San Francisco, Cal.
*W. A. BRONSON,	8 East 34th st., N. Y.

A. H. Brockway, - - - 13 Greene-ave., Brooklyn, N. Y.
*Seneca B. Brown, - - - Ft. Wayne, Ind.
E. A. Bogue, - - - - 29 East 20th st., N. Y.
C. R. Butler, - - - - 114 Euclid-ave., Cleveland, O.
L. Buffett, - - - - Cleveland, O.
T. L. Buckingham, - - - 1206 Vine st., Philadelphia, Pa.

C. C. Carroll, - - - - Meadville, Pa.
J. S. Cassidy, - - - - Covington, Ky.
J. F. Canine, - - - - 170 5th st., Louisville, Ky.
M. L. Chaim, - - - - 30 Cooper Institute, N. Y.
*H. S. Chase, - - - - 1206 Washington-ave., St. Louis.
James Cleland, - - - - Campus Martius, Detroit, Mich.
E. N. Clark, - - - - Beloit, Wis.
*Aaron Colton, - - - - Hudson, N. Y.
C. D. Cook, - - - - 133 Pacific st., Brooklyn, N. Y.
J. N. Crouse, - - - - 652 Wabash-ave., Chicago.
W. G. Cummings, - - - Sturgis, Mich.
Geo. H. Cushing, - - - 174 State st., Chicago.

E. B. David, - - - - Aledo, Ill.
G. C. Daboll, - - - - Buffalo, N. Y.
M. S. Dean, - - - - 174 State st., Chicago.
I. Douglass, - - - - - Romeo, Mich.
R. B. Donaldson, - - - Washington, D. C.
B. Oscar Doyle, - - - - 291 W. Jefferson st., Louisville, Ky.
*Chas. E. Dunn, - - - 148 2d st., Louisville, Ky.
W. C. Dyer, - - - - - 1135 Wabash-ave., Chicago.
*Wm. Dutch, - - - 26 Montgomery st., San Francisco,

Geo. E. Elliot, - - - Meadville, Pa.
C. D. Elliot, - - - - Franklin, Pa.

Geo. L. Field, - - - - Campus Martius, Detroit, Mich.
Isaiah Forbes, - - - - 8th st., near Olive, St. Louis.
*S. A. Freeman, - - - 416 Main st., Buffalo, N. Y.
*A. W. Freeman, - - - - 675 Wabash-ave., Chicago.

E. S. Gaylord, - - - - New Haven, Ct.
Wm. H. Goddard, - - - 65 West Walnut st., Louisville, Ky.
A. J. Grosvenor, - - - Troy, O.

D. C. Hawxhurst, - - - Battle Creek, Mich.
*J. L. Hill, - - - - - Gettysburg, Pa.
E. S. Holmes, - - - - Grand Rapids, Mich.
A. Holbrook, - - - - Milwaukee, Wis.

Wm. P. Horton,	1 Euclid-ave., Cleveland, O.
*E. Honsinger,	280 Park-ave., Chicago.
E. Hunter,	Manchester, Mich.
P. G. C. Hunt,	Indianapolis, Ind.
*Robert Huey,	330 S. 15th st., Philadelphia.
W. H. Jackson,	Ann Arbor, Mich.
*J. K. Jamison,	Connersville, Ind.
Jas. Johnstone,	Staunton, Va.
Homer Judd,	819 Locust st., St. Louis.
Geo. W. Keely,	Oxford, O.
G. W. Klump,	Williamsport, Pa.
*Isaac Knapp,	Fort Wayne, Ind.
Jas. S. Knapp,	15 Baronne st., New Orleans.
*C. C. Knowles,	San Francisco, Cal.
*S. E. Knowles,	San Francisco, Cal.
W. O. Kulp,	Davenport, Ia.
H. K. Lathrop, Jr.	153 Woodward-ave., Detroit, Mich.
W. E. Magill,	Erie, Pa.
J. F. Marriner,	Ottawa, Ill.
A. T. Metcalf,	Kalamazoo, Mich.
W. H. Morgan,	Nashville, Tenn.
S. H. McCall,	12 Henry st., Binghampton, N. Y.
B. R. McGregor,	Rochester, N. Y.
*A. F. McLain,	14 Baronne st., New Orleans,
*Jas. McManus,	Hartford, Ct.
J. H. McQuillen,	2100 Arch st., Phila.
*H. B. Noble,	Washington D. C.
L. G. Noel,	Nashville, Tenn.
*A. L. Northrop,	44 W. 46th st., N. Y.
Edmund Osmond,	266 Vine st., Cincinnati, O.
Corydon Palmer,	New York.
S. B. Palmer,	Syracuse, N. Y.
J. E. Phelps,	Chagrin Falls, O.
*C. N. Peirce,	501 N. 7th st., Philadelphia.
*F. Peabody,	91 W. Ches. cor. 3d, Louisville, Ky.
F. H. Rehwinkel,	Chillicothe, O.
F. J. Richards,	Williamsport, Pa.
J. C. Ross,	Nashville, Tenn.

*H. L. Sage,	Bridgeport, Ct.
*I. A. Salmon,	670 Tremont st., Boston.
*J. N. Scranton,	Bennington, Vt.
L. D. Shepard,	Hotel Boylston, Boston.
C. Stoddard Smith,	418 Adams st., Springfield, Ill.
H. A. Smith,	286 Race st., Cincinnati
John S. Smith,	210 Locust st., Columbia, Pa.
B. T. Spellman,	231 Woodward-ave., Detroit, Mich.
S. S. Southworth,	Niagara Falls, N. Y.
C. S. Stockton,	15 Cedar st., Newark, N. J.
John Stephan,	85 Michigan st., Cleveland, O.
*E. D. Swain,	69 Washington st., Chicago.
J. S. Swartley,	749 Michigan-ave., Chicago.
J. A. Swasey,	944 Wabash-ave., Chicago.
J. Taft,	117 W. 4th st., Cincinnati.
C. R. Taft,	Mansfield, O.
G. R. Thomas,	Campus Martius, Detroit, Mich.
S. B. Tizzard,	Dayton, O.
Wm. Van Antwerp,	Mt. Sterling, Ky.
J. R. Walker,	Nap. ave., cor. Coliseum, N. Orleans.
E. J. Waye,	Sandusky, O.
J. H. Warner,	Columbus, O.
Geo. Watt,	Xenia, O.
*Geo. F. Waters,	8 Beacon st., Boston.
M. H. Webb,	Lancaster, Pa.
I. J. Wetherbee,	46 Dover st., Boston.
S. Welchens,	Lancaster, Pa.
*J. C. Whinery,	Salem, O.
E. M. Wolfe,	Oil City, Pa.
*C. F. Wheeler,	Albany, New York.

The minutes of the last annual session were called for, and on motion the reading was dispensed with.

The amendment to the Constitution proposed by Dr. Goddard at the last annual session was taken up and adopted, viz to amend Section 3, Article III, by substituting for that Section, the following:

Section 3. Members to be of three classes.—The members of this Association shall be of three classes, viz: delegates, permanent and honorary members; the two former having equal rights and privileges, except eligibility to office; none being eligible to hold office, except permanent

members; the latter class to consist of prominent worthy members of the dental profession residing in foreign countries, who shall be elected by ballot.

[This amendment will be found already incorporated in the last pamphlet edition (1873.) of the Constitution, on page 3, as well as in the Constitution printed with the Transactions for 1873.—*Sec.*]

On motion of Dr. Dean, the amendment to Article II, Section 3 of the Code of Ethics, proposed by the Publication Committee, was adopted, viz: to substitute for the Section mentioned, the following:

SECTION 3. It is unprofessional to resort to public advertisements, such as cards, handbills, posters or signs, calling attention to peculiar styles of work, prices for services, special modes of operating, or to claim superiority over neighboring practitioners; to publish reports of cases, or certificates in the public prints; to go from house to house soliciting or performing operations; to circulate or recommend nostrums, or to perform any other similar acts. But nothing in this section shall be so construed as to imply that it is unprofessional for dentists to announce in the public prints or by card, simply their names, occupation, and place of business; or in the same manner to announce their removal, absence from, or return to business; or to issue to their patients appointment cards having a fee-bill for professional services thereon.

[This amendment will be found on page 21 of the pamphlet Constitution of 1873—*Sec.*]

Adjourned to 2 o'clock P. M.

FIRST DAY—AFTERNOON SESSION.

The Association met pursuant to adjournment, the President in the chair. The minutes of the morning session were read and approved.

Dr. Dean moved the re-adoption of the resolution rescinded at the last annual meeting, which is as follows:

Resolved, That henceforth no person shall be received as a delegate who is in arrears for dues, or until they have paid to the Treasurer the full amount due at the time their names were dropped for non-payment.

The question being upon Dr. Dean's motion, a discussion took place, participated in by Drs. Spellman, Goddard, Wetherbee, Atkinson, Thomas and Crouse, and the motion was carried.

Dr. Shepard, chairman of the Committee on Credentials, made a report which, as finally completed by various supplemental reports, was adopted as follows:

Iowa State Dental Society—W. O. Kulp.
Kentucky State Dental Association—W. H. Goddard, J. F. Canine, W. Van Antwerp, B. Oscar Doyle.
Lake Erie Dental Association—E. M. Wolfe.
Mad River Valley Dental Association of Ohio—A. J. Grosvenor, S. B. Tizzard, Geo. Watt.
Maine State Dental Society—C. M. Bailey.
Michigan Dental Association—E. S. Holmes, D. C. Hawxhurst, A. T. Metcalf.
Missouri State Dental Association—J. M. Austin.
New York Odontological Society—A. H. Brockway.
Second District Dental Society of New York—C. F. Allan.
Fifth District Dental Society of New York—S. B. Palmer.
Sixth District Dental Society of New York—S. H. McCall.
New Orleans Dental Associaton—J. S. Knapp.
New Jersey State Dental Society—C. S. Stockton.
Northern Ohio Dental Association—J. E. Phelps, John Stephan.
Ohio State Dental Society—J. H. Warner, W. P. Horton.
Odontograpic Society of Pennsylvania—M. H. Webb.
Pennsylvania State Dental Society—W. E. Magill, S. Welchens.
Tennessee Dental Association.—J. C. Ross, L. G. Noel.
Washington City Dental Society—R. B. Donaldson.
Wisconsin State Dental Society—E. N. Clark, A. Holbrook.
Boston Dental College—I. J. Wetherbee.
Dental School of Harvard University—L. D. Shepard.
Ohio Dental College—J. S. Cassidy, W. P. Horton.
Pennsylvania College of Dental Surgery—T. L. Buckingham.
Philadelphia Dental College—J. H. McQuillen.
Chicago Dental Society—J. A. Swasey, J. S. Swartley, M. S. Dean.
Dental Society of Detroit—H. K. Lathrop, Jr., Jas. Cleland.
Indiana State Dental Association—J. K. Jamison.
Illinois State Dental Society—Geo. H. Cushing, J. N. Crouse, W. C. Dyer, C. Stoddard Smith, E. B. David, J. F. Marriner.

The consideration of reports of Standing Committees was then taken up, and the first report in order, Dental Physiology, was read by the chairman, Dr. M. S. Dean.

Dr. McQuillen offered a transcript of the articles referred to in the report of Dr. Dean, as showing more fully the positions he

had taken therein, and on motion of Dr. Dean was invited to read the same; he accordingly read the paper, and discussed the report verbally.

The discussion was continued by Drs. Atkinson, Judd and Knapp.

By consent Dr. Crouse here introduced the subject of the testimonial fund to Dr. Barnum, and was followed by Drs. Keely, Goddard and others.

Adjourned until 7:30 P. M.

FIRST DAY—EVENING SESSION.

The association convened at 7:30 P. M., Pres. Buckingham in the chair. The minutes of the previous session were read and approved. The subject of Dental Physiology was continued, and discussed by Drs. Atkinson, Judd, Dean, Hunter, Knapp, Osmond, S. B. Palmer and McQuillen.

On motion the subject was passed.

The report on Dental Pathology was called for, and one written by Dr. H. S. Chase, a member of that committee, was read by Dr. Cushing.

The subject was then discussed by Drs. Atkinson, Judd, Bogue, Hunter, Butler, Morgan, Walker and Crouse.

Adjourned according to order of business.

SECOND DAY—MORNING SESSION.

The Association met pursuant to adjournment, the President in the chair. The minutes of the previous session were read and approved.

Dr. Shepard offered the following resolution, which was adopted:

Resolved, That the Treasurer is hereby instructed to notify permanent members who have not paid their annual dues, of their indebtedness, and inform them that if they owe for two years at the end of the present session, they are liable to be dropped from membership.

The subject of Dental Pathology and Surgery was continued, and discussed by Drs. Watt, Taft, Osmond, Morgan, Judd, Spellman, McQuillen, Atkinson, Dean and Bogue.

On motion the subject was passed.

The report on Histology was called for, and further time granted to the committee.

Dr. Bogue moved that a committee of three be appointed for the purpose of presenting appropriate memorial resolutions in regard to the decease of Professor Hitchcock. Carried, and Drs. Bogue, Taft and Shepard appointed.

The report on Dental Chemistry was called for, and read by Dr. H. A. Smith, chairman of that committee.

Dr. Shepard gave notice of the following amendment to the constitution, viz:

Add to article IV, the clause, "The Executive Committee shall have power to change the place determined upon for the regular meeting, for extraordinary reasons, notice of such change to be published in due season."

Adjourned until 7:30 P. M.

SECOND DAY—EVENING SESSION.

The Association convened at 8 o'clock, Vice-President Forbes in the chair. The minutes of the previous meeting were read and approved. The discussion of the report on Dental Chemistry was declared in order, but on motion was passed.

The Report on Histology was called for, and further time granted the committee.

Dr. Taft moved that, as there were no members of the Committee on Dental Therapeutics present, the Chair appoint some

member to open the subject for discussion, at the proper time. Carried, and the Chair appointed Dr. Taft in accordance with the resolution.

On motion of Dr. Atkinson, the committee on Etiology was called, and Dr. Webb, a member of that committee read a report.

On motion the further consideration of the subject was postponed until the chairman of that committee should be prepared to present his report.

The Committee on Operative Dentistry was called, and the chairman, Dr. Shepard, read a report; after which the subject was discussed by Drs. Crouse, Wetherbee and Thomas.

Adjourned.

THIRD DAY—MORNING SESSION.

The Association met pursuant to adjournment, at 10 A. M., the President in the chair. The minutes of the preceding meeting were read, corrected and approved.

Miscellaneous business was called up, and Dr. Rehwinkel, chairman of the committee appointed last year, to endeavor to secure the appointment of Dental Surgeons in the army and navy, reported that for various reasons, one of which was the tendency of Congress towards retrenchment, the committee deemed it advisable to make no attempt at present to accomplish anything in that direction; and on motion of Dr. Crouse, the report was received and adopted, and the committee discharged.

The subject of Operative Dentistry was continued, and discussed by Drs. Cushing, Butler, Knapp, Allen, Keely, Kulp, Stockton, Osmond, Bogue, Judd, McQuillen and Allport.

On motion the time of adjournment was extended fifteen minutes beyond the usual time.

Dr. Bogue, chairman of the Committee to draft Memorial Resolutions relative to the death of Dr. Hitchcock, reported the following, which was unanimously adopted:

Whereas, This Association has with sorrow learned of the death of Prof. Thos. B. Hitchcock, of the Harvard Dental School, one of our most valued members, and the chairman for this year of the committee on Histology and Microscopy; therefore

Resolved, That we signify in this public manner our sense of the great loss which the profession and the cause of Dental Education has sustained; and that this resolution be inserted in the records in the place where the report of the Committee would have appeared.

E. A. BOGUE,
J. TAFT,
L. D. SHEPARD. } *Committe.*

On motion the selection of the place of next meeting, and the election of officers, was made the special order for the evening session.

Adjourned until 2:30 P. M.

THIRD DAY—AFTERNOON SESSION.

The Association convened at the appointed hour, the President in the chair. The minutes of the preceding session were read and approved.

The subject of operative dentistry was continued, and discussed by Drs. S. B. Palmer, Walker, Knapp, Atkinson, Shepard, Webb, and Taft; and on motion the subject was passed.

A motion to reconsider this vote was carried, and the original motion was renewed and lost. The subject was again taken up and discussed by Drs. Taft, Thomas, and Rehwinkel; and on motion the subject was passed.

The Committee on Dental Appliances made a report, through its chairman, Dr. Field, which was accepted, and referred to the Publication Committee.

On motion, the subject of Etiology was resumed, and a report read by Dr. McQuillen. Discussed by Drs. McQuillen and Noel.

Adjourned till 7:30 P. M.

THIRD DAY—EVENING SESSION.

The Association convened at 8 o'clock, President Buckingham in the chair. The minutes of the preceding session were read and approved.

The special order of the evening, viz: selection of place of next meeting, and election of officers, was taken up and proceeded with.

Dr. Cushing, from the committee to nominate a place for next meeting, reported that the committee nominated only Niagara. The ballot being taken, Niagara was selected.

The election of officers was then proceeded with, and resulted as follows:

President—M. S. Dean, Chicago.
First Vice President—G. W. Keely, Oxford, Ohio.
Second Vice President—J. S. Knapp, New Orleans.
Corresponding Secretary—G. L. Field, Detroit.
Recording Secretary—C. Stoddard Smith, Springfield, Illinois.
Treasurer—W. H. Goddard, Louisville, Kentucky.
Executive Committee—(New members) A. H. Brockway, Brooklyn; G. C. Daboll, Buffalo; S. B. Palmer, Syracuse.

On motion, the order of business was suspended, to enable Dr. Cushing to offer the following amendments to the Constitution, which were lost for want of a unanimous vote, and were laid over until next year, viz:

To amend Art. V, Sec. 6,—under head of "Sub-committees—First Division, Committee of Arrangements,"—by striking out these words—"if practicable, reside at or near the place at which the Association is to hold its next annual meeting, and shall"—

To amend Art. IV, by adding this clause;—"After the selection of a place of meeting there shall be appointed by the President annually, a committee of three, residing at or near the place selected for the next meeting, whose duty it shall be to procure rooms for meetings, clinics and for the exhibition of mechanical appliances, and to make such other local arrangements as may be needed for the Association. This committee shall act under the direction of the first division of the Executive Committee."

Adjourned.

FOURTH DAY—MORNING SESSION,

The Association met pursuant to adjournment, President Buckingham in the chair; the minutes of the previous meeting were read and approved.

On motion of Dr. Judd, the subject of Etiology was passed.

The Treasurer made his report, as follows, which was accepted and adopted.

WM. H. GODDARD, TREASURER, IN ACCOUNT WITH AMERICAN DENTAL ASSOCIATION.

Dr. August, 5th 1873.

To Balance, in my hands		$320 13
Cash, dues, for 1872	$ 25 00	
" " " 1873	580 00	
		605 00
		$925 13

Cr. August 4th, 1873.

By paid Voucher No. 1	$100 00	
" " No. 2	50 00	
" " No. 3	50 00	
" " No. 4	11 90	
" " No. 5	500 00	
		711 90
August, 1874, To Balance,		213 23
		$925 13

WM. H. GODDARD, *Treasurer.*

We have examined the Report of the Treasurer, and find it correct.

L. D. SHEPARD,
S. B. PALMER, } *Committee.*

DETROIT, MICH., *August 6th, 1874.*

The Committee on Volunteer Essays recommended the reading of a paper handed in by Dr. I. Douglass of Michigan, upon apparent death by chloroform, and it was accordingly read by Dr. Cushing, and referred to the Publication Committee.

On motion of Dr. Shepard, the salaries of the Secretary and Treasurer were ordered paid.

Dr. Shepard, was on motion allowed to withdraw a resolution that he had previously offered, but which had not been stated by the chair and which at his request had been laid on the table for the time, and to substitute for the same the following, which was unanimously passed.

Resolved, That the American Dental Association fully appreciates the promptness with which Dr. S. S. White responded to the requests of the dental profession, to take the management of the suit for the ascertainment of the rights of the public in regard to the use of Vulcanite for dental purposes; and would respectfully request him to continue his valuable aid in carrying up the case for final adjudication by the Supreme Court of the U. S., pledging him our moral and material support in defraying the expenses which may be incurred in the future.

The Subject of Dental Education was taken up, and the reports of the Standing Committee and Essays on that subject were ordered read before it was discussed.

A letter was received from Prof. McLain, of New Orleans, the chairman of the Committee, expressing regrets at his inability to be present, and wishing the association a pleasant and profitable session. The letter being accompanied by Prof. McLain's Report as chairman of the Committee, was read by Prof. Knapp. Dr. Keely, a member of the Committee, followed with an additional report.

The subject was then discussed by Drs. Allen, Walker, Taft and Thomas.

On motion of Dr. Shepard, it was resolved that the time of speakers on this subject be limited to ten minutes.

The subject was further discussed by Drs. Stockton, Bogue, Butler, Shepard, Allport, Morgan, Wetherbee, McQuillen, Crouse, Atkinson, Osmond, Watt, and Rehwinkel.

Dr. Butler offered the following resolution, which was adopted:

Resolved, That it is the opinion of the American Dental Association,

that the time has fully come, when degrees should not be conferred by Dental Colleges upon any student who has attended but one course of lectures.

The vote was afterwards reconsidered and the resolution laid over until next year.

Adjourned.

FOURTH DAY—AFTERNOON SESSION.

The Association met pursuant to adjournment, the President in the chair. The minutes were read and approved.

The bill of the Committee of Arrangements was read and adopted and ordered paid.

Dr. Stockton offered the following amendment to the Constitution; viz, to amend Article V, Section 1, as follows: in lieu of the second clause, substitute the following:

The three names having the greatest number of votes, shall be the sole nominees for President, and first and second Vice-President, and upon the next ballot these three names only, shall be voted upon; the name receiving the highest number of votes shall be declared President; and the name receiving the next highest, shall be the first Vice-President; and that receiving the next highest, shall be the second Vice-President.

Laid over one year according to rule.

Dr. Shepard offered the following, which was adopted:

Resolved, That the thanks of this Association be tendered to the Reporters of the press; to the proprietors of the hotels; to the local Committee of the Association, to whose efforts and labors has been due in a large degree, the success and pleasure of the present meeting; to the city authorities of Detroit, for the free use of the Council Chamber; and to the Dentists of Detroit, for the very generous and hospitable manner in which they have received and entertained the Association.

Dr. Judd moved a resolution, directing that the volumes of transactions of previous years, now on hand, excepting those of last session, be donated to such individuals as might call for them; and on motion of Dr. Thomas that motion was so amended that

the balance remaining, should be donated to the local societies of the country; the recipients to pay costs of transportation. The resolution and amendment were both carried.

The Nominating Committee reported the following as the Standing Committees for the ensuing year, which upon vote were duly elected;

Physiology—J. H. McQuillen, E. S. Gaylord, J. R. Walker
Pathology—H. Judd, L. D. Shepard, J. S. Knapp.
Histology and Microscopy—J. Taft, E. D. Swain, W. H. Jackson.
Chemistry—H. A. Smith, S. B. Palmer, J. S. Cassidy.
Therapeutics—E. A. Bogue, W. O. Kulp, C. C. Carroll.
Operative Dentistry—G. H. Cushing, C. S. Stockton, S. H. McCall.
Mechanical Dentistry—F. H. Rehwinkel, J. F. Canine, J. Johnstone.
Dental Education—G. W. Keely, A. H. Brockway, S. Welchens.
Dental Literature—I. Knapp, L. G. Noel, C. D. Cook.
Etiology—H. S. Chase, D. C. Hawxhurst, C. S. Smith.
Prize Essays—I. Forbes, G. L. Field, R. B. Donaldson.

The regular order of business was resumed, and the subject of Dental Education was further discussed by Drs. Rehwinkel, Horton, and Judd.

Dr. Bogue offered the following resolutions:

Resolved, That it is the sense of this Association that no dental student should be graduated from any dental college without at least three years instruction, including private pupilage and college instruction; the latter should in no case embrace less than two full regular courses.

Resolved, That this Association suggest to the different Colleges of this country to appoint a common Examining Committee, consisting of five members, three to be a quorum, none of whom shall be in connection with any dental college, whose duty it shall be to examine all applicants for graduation, and decide upon the same.

Dr. Judd offered the following:

Resolved, That this Association recommends to all local societies, the adoption of rules prohibiting their members from taking students for a less period than three years, or for such time as will complete a three years pupilage.

These resolutions were by vote laid over until the next annual meeting.

Dr. Spellman moved that the committee to co-operate with Dr. S. S. White in defending the rights of the profession against the Vulcanite Company be called on for a report; and Dr. Judd the chairman, made a brief verbal report, which upon motion was received, and the committee continued, and the thanks of the Association tendered to them for the manner in which they have discharged their duties.

Dr. Knapp offered the following;

Resolved, That the thanks of this Association are due, and are hereby tendered to the Michigan State Dental Protective Union, for the energetic and so far successful manner in which its officers have resisted the claims of Josiah Bacon, and the Goodyear Dental Vulcanite Company.

After discussion by Drs. Spellman, Horton, Morgan, Wetherbee and Shepard, the resolution was adopted.

Dr. Allport offered the following amendment to the Constitution:

Amend Section 4, Article III, by adding the following:

This Association will hereafter receive no delegate who shall after this date, enter the profession without first having graduated at some reputable dental or medical college.

Laid over one year according to rule.

The Publication Committee made the following report which was accepted and adopted:

Five hundred copies of the Transactions of the American Dental Association, for the years 1871 and 1872 were published in one volume, two hundred and thirty-five of which were bound in muslin, the balance in paper, for..... $639.48

Note-Circulars, Envelopes and Pasters,.....	$ 9.00	
Postage, Expressage, &c.,.....	60.48	
		69.48
Total for years 71-2,.....		$708.96

Cr.

By Cash from Treasurer,.....	$650.00	
" Transactions sold by Publication Committee,.....	64.00	
		714.00
Balance due Association,.....		$5.04

M. S. DEAN, *Chairman of Pub. Com.*

The Publication Committee also made the following report:

Five hundred copies of the Transactions of the American Dental Association for the year 1873 have been published, about two hundred and twenty-five of which were bound in muslin, the balance in paper. Five hundred copies of the Amended Constitution were also published,

The total amount, as per bills, for publishing Transactions, Constitution, Histological Illustrations, and other printed matter.....		$740.12
Postage,.....	$31.90	
Expressage,.....	2.00	
		33.90
		$774.02

Cr.

By Treasurer,.....	$500.00	
" Balance last year,.....	5.04	
" Transactions sold by Publication Committee, ...	55.00	
		560.04
Balance due Publication Committee,.....		$213.98

M. S. DEAN, *Chairman Pub. Com.*

The report was accepted, adopted and the bill ordered paid.

On motion of Dr. Allport, the Publication Committee was instructed to print not exceeding two hundred and fifty copies of Transactions, to be bound in paper covers.

Dr. S. B. Palmer, chairman of the committee appointed to prepare a popular circular on the care of the teeth, reported that the matter had been collected and embodied, but was not deemed sufficiently matured at the present time; the committee therefore asked further time, which was granted.

Dr. Keely, chairman of the Committee on the Barnum Testimonial Fund, reported progress, and asked further time, for the reason that many subscriptions had not been paid, and many societies had not been directly appealed to.

On motion the report was accepted and adopted, and the committee continued.

On motion to install the newly elected officers, Drs. Morgan and Allport were appointed a committee to induct them into office, and they were accordingly installed.

The report of the Committee on Mechanical Dentistry, written by Dr. E. D. Swain, was then read by Dr. Dean.

Dr. McQuillen offered the following amendment to the Constitution, viz:

Amend Art. VII so as to read, "twenty-four members shall constitute a quorum for the transaction of business in this Association.

Laid over one year under the rule.

The subjects of Therapeutics, Histology and Literature were passed, as well as the report of the Committee on Local Societies.

On motion of Dr. Cushing it was

Resolved, That the Treasurer be instructed to pay the usual orders for current expenses, and the drafts of the Publication Committee, when required.

The President appointed as members of the Publication Committee, Drs. A. H. Brockway, Brooklyn, and L. D. Shepard of Boston.

The Association then adjourned, to meet at Niagara Falls on the first Tuesday, (3d) of August, 1875.

REPORTS

OF

STANDING COMMITTEES,

VOLUNTEER ESSAYS,

AND

DISCUSSIONS.

REPORT OF THE COMMITTEE

ON

DENTAL PHYSIOLOGY.

By M. S. DEAN, Chairman.

SINCE presenting a report on Dental Physiology at the last session of this Association, nothing of importance, that is new, has come to the notice of the writer. For this reason, your committee must take a step backwards in order to find materials for the present report.

At the last session I gave a brief synopsis of a paper written by Prof. H. S. Chase, which had been published in the "Missouri Dental Journal," upon the absorption of the deciduous teeth. My attention has lately been called to a series of articles upon the same subject which were published in the "Dental Cosmos," in the year 1860, by Prof. McQuillen, in which similar views were set forth in regard to some of the phenomena attending the process of absorption of the deciduous teeth.

The articles referred to may be found commencing on pages 517—563 of Vol. I.

As the views therein expressed are, in many respects, very plausible ones, and have been maintained by the writer with uncommon ability; and, as I am informed are held and taught by the author at the present time, it does not seem inappropriate to lay them before this Association at this late day—and more especially so, as the subject of the absorption of the deciduous teeth, has never, that I am aware of, been discussed at any meeting of

this Association. I shall not, however, give a synopsis of these articles, but refer as briefly as possible to a few points in the author's theory of the absorption of these tissues.

He considers the wasting away of the roots of these teeth to be due to the *lessening* of the supply of nutritive materials to these tissues—"inducing atrophy"—or "retrograde metamorphosis," and not to the work of an absorbent organ. To use his own language: he says—"The necessity of an acrid substance or carneous body to effect the disintegration and removal even of the hard substances such as the osseous and dental tissues is not demanded; molecular disintegration fully accounts for it. The component cells having lived their appointed time, they degenerate, and their contents, assuming a fluid condition, are taken up by the veins or lymphatic radicals, neither of which can be looked upon as being capable of breaking down any tissue; for the vessels distributed to a part, be they arteries, veins or lymphatics are but the conduits or carriers of nutrient fluids to, and waste materials from the tissues."

In his closing remarks he says:—"Lastly, the fact must not be lost sight of, that the dental tissues are but a *congeries* of *cells* constituting an animal matrix, in which the calcareous salts are deposited; that these cells have a definite period of existence, and that by molecular disintegration they degenerate and are cast off. As the animal matrix degenerates cell by cell, their calcareous contents are liberated and become mixed with the fluids to be taken up by the venous or lymphatic radicals. If, in addition to this waste there is no supply of new material, *atrophy* is the result, and thus the roots of the deciduous teeth disappear."

The *immediate* causes which *reduce* the nutritive supply to the temporary teeth, the author explains in this wise: "At the time when the absorptive process begins, a new life springs up in the permanent germ which has for some time remained in a state of dormant vitality; it draws from the blood materials inservient to its *development* and *growth*, and in so doing removes from the current flowing to it and the deciduous tooth, the constituents necessary to *repair* the *waste* that takes place in the latter."

"In support of this position" he refers to the experiments of

Chossat, in producing artificial atrophy of the bones of animals by depriving their food of all calcareous elements.

The sympathetic nerve, he believes, also has an influence upon these processes; "Branches of this nerve are distributed alike to the pulp of the deciduous, and the papillæ of the permanent tooth, and" he says, "there can be but little question that the *development* of the one and the *absorption* of the other, is more or less dependent upon this nervous connection."

Besides these physiological causes, he holds that there is a physical one that plays an important part by diminishing the volume of the vessels of supply to the temporary teeth. On this point he says: "In addition to drawing to itself all or most of the nutrient materials from the neighboring current, as the permanent papilla increases in size, and the crown is formed, it makes a graduated pressure, first upon the capillary vessels of the osseous partition and then on those of the deciduous tooth; thereby arresting or diminishing the flow of blood distributed to those tissues. By these two causes not only the *quality* but the *quantity* of blood sent to the deciduous tooth is modified, and absorption favored."

I have quoted the explanation of the remote causes, which, according to his theory induce atrophy in the deciduous teeth, tolerably fully; not however with a view of controverting them, although they are not conclusive to my mind—but simply because I deem it due to a fair representation of this author's views upon that subject. I shall however, endeavor to examine what might be called, according to his theory, the more *immediate* cause of the absorption of these teeth—atrophy—somewhat carefully.

This view of the mode of absorption of the deciduous teeth, has been maintained by the author in an able and scholarly manner, by analogical reasoning; yet, in my mind there still remain objections to that writer's theory which I cannot reconcile with what I believe to be established facts.

Now if "*supply*" and "*waste*" of materials are constantly going on in the *dentine*, through what *channels* are these supplies conveyed *to* the dentine, and the waste carried *from* it?

The answer must be—through the vessels that enter and depart through the apicial foramen. If, then, atrophy results, in the *dentine*, from a deficient supply of nutrient matter, this sup-

ply must have been cut off from these vessels that *enter* the foramen, and the atrophy that ensues must occur in *those parts* which are deprived of their supply from these vessels—namely the dentine of the tooth.

The "waste" must be carried off by the vessels that make their *exit* from the foramen, and, if the waste of the dentine is increased, this *excess* of material must also be removed through the same channel.

Absorption of the *dentine* then, according to this view would commence in the internal structure of the root, and the "waste" would be as equally distributed when in *excess* of the "supply," as when the two processes were evenly balanced.

It seems to me that this process, or mode, is the one we might expect to occur, if the *scanty supply* of new materials to the root, is the cause of the disappearance of the deciduous tooth —in other words is the cause of the absorption of the dental tissues.

But the phenomena that we observe in the absorption of the deciduous teeth are of a totally different nature. Absorption *commences* and *continues* externally. The part that is absorbed is that, and that only, which lies in immediate contact with an absorbent papilla; while the portions lying away from it retain their integrity for months and even for years.

If we admit that pressure upon the root membrane may cause atrophy of that portion of the cementum immediately underlying it, it cannot be claimed that the external portion of the *dentine* of the root, that is first removed—at whatever point this may chance to occur—has been deprived of *its* supply of nutrient matter by this pressure any more than is any other portion of the dentine. As Dr. McQuillen has justly observed in a more recent article in the Cosmos (Vol. 6 page 123) we do sometimes find the roots of the teeth of aged persons, which have undoubtedly been lessened in size by absorption; but may we not account for this loss of substance from the exterior portion of the tooth, on a more rational hypothesis than to attribute it to atrophy—a wasting away of a part from defective nutrition?

In these cases where the roots of the permanent teeth have become diminished in size, Prof. McQuillen says—and says truly —that "the pulp cavities are very small or entirely obliterated."

This being the case could there have been any deficiency in the supply of materials to the dentine? Assuredly not, as the formation of new dentine shows that there is an excess rather than a deficiency in the material supply to this part.

Now in the light of these facts would it not be reasonable to conclude that this wasting away of the external portion of the root was due to the abnormal action of the root membrane, which, from irritation had increased in vascularity; that the substance of the root had been removed by an unhealthy activity of the vascular parts, differing entirely from that physiological process by which the deciduous teeth are removed?

Then again if the absorption of the deciduous teeth is the result of deficiency of nutrition, why are not the pulpless milk teeth removed more rapidly than are those which have living pulps? In the former the supply to the dentine is mostly cut off—I contend *entirely*—and the "waste" should increase in proportion as the "supply" is diminished—if the loss of substance is due to atrophy. But the facts are, we find the roots of the pulpless deciduous teeth are even more slowly absorbed than are the roots of the living ones. These facts, and I believe they are facts, are antagonistic to the theory that the loss of the roots of these teeth is due to *atrophy*.

I may misapprehend the meaning of Prof. McQuillen but from his language it would seem that he considers that the cells from which the dentine is formed, still retain their individuality. This is certainly Prof. Chase's view, and is held by many others. It seems to me that the perfectly matured dentine is not made up of cells, but made *out of* cells. To use the language of Prof. McQuillen, the cells are "*converted*" into dentine. According to Tomes, Boll, Beal, Waldeyer and many others the dentine is the *direct product* of the *conversion* of the odontoblasts. In Stricker's Histology, Waldeyer says—"It appears that the dentine with all its constituents proceeds from odontoblasts that have become metamorphosed in their *form* and *chemical constituents*." If this be true the dentine does not consist of individual cells—or of cells at all—but of the *product* of cells.

In the articles under consideration the author holds that the cells of the dentine have a definite period of existence. It would seem to me that their period of existence depends entirely

upon circumstances. The fully matured dentine is not disintegrated in the mouth unless surrounded by morbidly active vascular tissues, or from chemical or mechanical means, even if the supply of nutritive materials is entirely cut off. This is substantiated by common observation.

To see a tooth, which had lost its dental pulp a quarter of a century ago, the canal of the root having been perfectly filled, and the surrounding tissues remaining in a comparatively healthy condition—to see this tooth without perceptible change of texure after the nutritive supply to the dentine had been withdrawn for a period of twenty-five years—is what may be so commonly observed by the dental practitioner that it ceases to create astonishment. The period of duration of the dentine seems to depend entirely upon surrounding conditions and these conditions are extremely variable.

I am very naturally led here to say a few words in regard to the vitality of the dentine of pulpless teeth. I very often hear such dentine spoken of, as possessing a certain amount of vitality, —some claiming even, that they have found it, in rare cases, sensitive to the touch of an instrument.

If this dentine be living, whence is its nutritive supply derived? Can dentine receive nutriment from any other source than the germinal matter of dentinal cells? It is claimed that it receives its supply from the same source that nourishes the cementum. Can the cementum receive nourishment from the plasma of the blood, before it has been submitted to the transforming influence of the osteoblasts, converting it into germinal matter? Can any tissue receive nutrition *directly* from any other source than from the same kind of cells from which they are composed?

I think all these questions will be answered in the negative. If so, where do we find the odontoblasts that can convert the plasma of the blood into pabulum for the pulpless dentine.

I wish it distinctly understood that the above remarks are not made with a view of controverting any position taken by Prof. McQuillen, for in the articles under review, written fourteen years ago, he annunciates substantially I think the same general idea, in the following words:—"Nutrition however, does not consist merely in the component particles of the organs attracting

the fibrin, albumen and other materials of the blood which flows through them, but the assimilating particles through *cell agency*, must infuse into those newly added to them *their own vital properties*."

The general principle in regard to the function of the cells in nutrition, which I have endeavored to turn to account in proof of the non-vitality of pulpless dentine, was derived from the writings of Lionel S. Beale, who says: "I have endeavored to show, not that the germinal matter acts upon matter which passes by it, and so changes it, without undergoing change itself, but that every kind of formed material and tissue passes through the condition of germinal matter, and therefore in the formation of fibrous tissue, cartilage, &c., pabulum of the blood is taken up by the germinal matter, becomes germinal matter, and in turn is gradually resolved into the matrix or inter-cellular substance."

I had not at the outset of my remarks on the absorptive process, intended to bring to your notice any other than the theory set forth in these articles of Prof. McQuillen; but, for the sake of opening the subject more fully for discussion, rather than with the view of offering anything that will be new to the Association, I will briefly call to your minds some facts in connection with the generally accepted theory in regard to the *immediate* agents that affect the removal of the deciduous teeth.

The majority of the most eminent Physiologists agree unanimously in this: That these teeth are removed by the direct agency of an absorbent papilla. Some difference of opinion exists among them, however, as to the *origin* of this absorbent organ and its *mode* of operation—but all agree that it is the work of an absorbent agent lying external to the root.

As Tomes' views comprehend essentially the opinions of this larger class of Histologists, I will quote a few lines upon this point as an exponent of their general views, from his excellent work—"A System of Dental Surgery."

On page 73 he says:—"It has already been stated that the surface of the papilla is closely applied to the wasting surface of the tooth; and in favorable specimens it may be shown that the individual indentations correspond to, and are occupied by these *large cells*. On several occasions I have obtained specimens in which the two retained their natural positions. Each semicircular

indentation in the dentine was occupied by a *compound cell.* In another place (page 83) he says: "The precise nature of the action by which the cells *eat away* the hard tooth substance still remains a matter of great uncertainty." [The italics are my own.]

In Striker's Histology, Waldeyer, without expressing any opinion of his own, quotes Kehrer as believing "that the amœboid cells of the granulations destroy the dental tissues by their mining process, effected by their pseudopodia," (long finger like processes.)

Kölliker, in some recent remarks (2d March, 1872) which were published in the Missouri Dental Journal, translated from the Virteljahrschrift by Dr. Judd, attributes the removal of the deciduous roots to "giant cells." He says: (1) "When the bones and teeth in the normal course of development take on a resorption process, they invariably present a finely pitted external surface, which pits are commonly designated as the lacunæ of Howship. (2) The lacunæ mentioned, are occupied by *giant cells* in such a way that in every pit there is one giant cell. However, under certain circumstances also, single giant cells fill two pits, or, larger pits several myeloplaxes (giant cells.) (3) These giant cells do not originate by a metamorphosis of the cells of the dissolving hard formations, but by transformation of the formation cells of the osseous tissues (the osteoblasts,) and are organs which dissolve the osseous and dental tissues; hence they are designated by the name of ostoklasts (bone breakers) or ostophogen (bone eaters.)

"The giant cells"—he continues—"play a part in the teeth at the time of their shedding; the milk teeth are eroded upon their under side into furrows and pits by a connected layer of such cells in such manner as the bones, whereby in like manner genuine very regular Howshipian lacunæ make their appearance."

He describes these absorbent cells thus: "The ostoklasts show sometimes upon their sides which are turned towards the bone, a mass of fine hairs or threads, standing closely together, which similate as much as possible movable cellular processes penetrating the hard tissues."

These are the more recent expressions of Kölliker, and are the prevailing views of physiologists and histologists of today—

all agreeing that the work of absorption is performed by an absorbent organ lying externally to the root, but not in perfect accord as to the precise nature by which the cells accomplish this work.

Tomes expresses these general views more clearly and intelligibly than any other author whose writings I have read, and if not the highest is as high authority as we have on this subject.

In conclusion—It is of little consequence to us by what name the cells that perform this work are designated by different histologists:—they may be termed the myeloplaxes, ostoklasts, or ostophogen—giant cells, bone breakers, or bone eaters, with their hairy like filaments that tear away the dental tissues; or they may be called very large cells, compound or multiform cells—or which sounds a little more learned, we may call them *amœboid* cells which, by their pseudopodia, perform the same work in a similar manner;—it is of little consequence, I say, which of the various names these cells bear that remove the tissues of the deciduous teeth, provided we are enabled to comprehend the general functions of these cells.

DISCUSSIONS.

Prof. McQuillen: In the presentation of the report of the committee on Physiology, Dr. Dean has, as he states, made extracts from a paper published by me, some fourteen years ago.

In doing this I am perfectly satisfied that it was his intention, not only in those extracts, but in the comments made in connection with them, to fairly present my views upon this subject. That the members, however, may properly understand my meaning, it is necessary that the connecting links between those extracts should be submitted to them. At the time when that paper was written, my aim was to make an application of the general law recognized by physiologists as governing nutrition in other organs and tissues, to the teeth, and that the changes taking place in them were in accordance with, and governed by,

that law. Familiar with and accepting some of the modifications in the views advanced since that by physiologists in relation to the histogeny of cells, I have as yet seen nothing to induce me to modify my views in relation to the absorption of the roots of the deciduous teeth, and therefore, if agreeable to the Society, I ask that the paper be read at this time.

[On motion of Dr. Dean, it was unanimously resolved that the paper should be read.]

ABSORPTION OF THE ROOTS

OF THE

DECIDUOUS TEETH.

By J. H. McQUILLEN.

[From the Dental Cosmos—Vol. I, p. 517—1860.]

IN the varied changes that occur during the successive periods of life in the different organs of the body, none are more remarkable than those presented in the development, growth, eruption, subsequent absorption of the fangs and exuviation of the crowns of the deciduous teeth. Subserving for a brief season important purposes of the economy, and then giving place to more durable organs, their strange eventful history presents phenomena of the most singular and instructive character.

The object of this communication however, is not to enter into a *minute* consideration of the successive changes that these teeth undergo in passing from the rudimental state to the perfected condition, but rather to take them at that point, and endeavor to account for the retrograde metamorphosis by which the perfectly consolidated dental tissues are removed.

Prior to advancing the views entertained by the writer, of the cause of this removal, it may not be amiss to direct attention to the existing dental literature on this subject.

From the earliest period down to the present, this phenomenon has attracted attention, and various theories, more or less varied in their character, have been advanced from time to time in explanation of the process. Thus many of the ancients supposed that the milk teeth had no roots. Others conjectured that the crowns of the milk teeth separated from their roots, just as the

horns of the stag fall from the head that bore them, and that the root then gave birth to a new tooth. "Fauchard and Bourdet attributed their removal to the action of a corrosive fluid. Bumon thought they were worn away by the rising tooth. Lecluse was of the opinion that when the process of their removal begins, their vessels cease to supply nourshing juices, and that they are broken up by a species of *maceration*, while Jordan believed it was both by abrasion and corrosion. Laforge, observing a fungiform or carneous substance behind the root of a temporary tooth, (which had in fact been noticed by Bourdet, and supposed by him to exhale a fluid possessed of solvent qualities,) gave it the name of absorbing apparel, and assigned to it the office of removing the root of the primary tooth. Delabarre, who treated this subject at greater length, and apparently investigated it more closely, adopted the views of Laforge." Prof. Harris, in the last edition of his work, where the views above will be found *in extenso*, says: "The more he has examined the subject, (of the destruction of the roots of the temporary teeth,) the more fully he has become convinced, that it is the result of the action of this fleshy tubercle (carneous body of Laforge) upon them. And while its formation seems to be the result of the contraction of the dental sac and its appendages, for the purpose of effecting the eruption of the permanent tooth, it is especially charged with the removal of everything that would obstruct its passage." Fox attributes it to pressure of the crown of the permanent teeth upon the fangs of the temporary; but admits, further on, that it frequently occurs without such pressure, and then remarks: "These circumstances seem to prove that the absorption of the fangs of the temporary teeth is an action of nature sometimes independent of pressure, and it is a very singular circumstance, that at a time of life when so great a quantity of ossific matter is poured forth from all the arteries concerned in the formation of bone, in one particular, there should thus be an absorption of this substance taking place." Bell rejects the theory of pressure, and attributes the removal to the action of absorbent vessels; he does not state whether veins or lymphatics perform the act. Nasmyth says: "The functions of the capsular membrane," or as he styles it in another part of his work, the *capsulo periosteal membrane* investing the fangs, "are of great importance at the period when the temporary teeth are removed

to make room for the permanent series, inasmuch as it is the agent by which the removal is effected." This view was also advocated in a paper read before the Odontological Society by Mr. Spence Bate. Tomes after describing the microscopical appearances presented by the fleshy mass found under the absorbed surface of the deciduous teeth, remarks, a few pages further on, "that all recent observers will, I think, admit that the dental tissues are removed through the agency of the growing papilla, and I do not think a difference of structure or function, referable to the particular tissues from which it may have arisen, can be established." He says, in conclusion, that "the observations, at present at our disposal, are not sufficiently numerous and varied to admit of the deduction of any general law, as regards the power by which absorption of one tissue by another is effected. But I think they point strongly to the idea, that a cell structure, in an active state of development, is capable of appropriating or removing out of its way a matured tissue."

The above constitute the various theories that have been advanced or adopted at different periods by dental writers in explanation of this phenomenon. Numerous as they are, to those who regard with any favor the views at present entertained by physiologists generally, in relation to histogeny or the development and formation of tissues, these theories must appear most vague and unsatisfactory.

In entering upon the consideration of this subject, the teeth must not be viewed as isolated organs, but as integral portions of the entire economy, and subject to the same influences that control the function of nutrition in other parts of the organism; and it must be remembered, that though nutrition is not an object of microscopic observation, it is a well attested fact, that, from the earliest period of fœtal existance until the cessation of life, two operations are constantly taking place in the elementary structure of the various tissues and organs, viz: 1. *Composition*, or the process by which the nutritive materials of the blood become assimilated; 2. *Decomposition*, or that action by which old parts are removed. These (constituting the function of nutrition) occur in every part of the economy, modified, however in their action by the age, constitution, state of health, and relative density of the different tissues; being most active in youth, greatly

lessened in old age; occurring with greater rapidity in vascular than non-vascular tissues. As a general rule, the greater the demand for the functional activity of an organ or tissue, the more energetic its nutrition. The osseous and dental tissues being the lowest in the scale of vitality, the change is slow, but nevertheless constant. Among the evidences of the renewal of the material of bones, are the formation of the cells, the development of the frontal and sphenoidal sinuses in childhood, the absorption of bones under the pressure of swellings, the absorption of the alveoli of the jaws, and the thinning of the cranial bones in old age, etc. The enlargement of the cavities of the bones, with enlargement of the whole bone itself, and indeed the mere growth of so solid a body by interstitial assimilation, and the changes that its form undergoes during it, are not conceivable without a constant removal of osseous particles from certain parts, and the deposition of similar particles at other parts; consequently not without a change of material.

As in the *development* and *formation* of the various tissues the primary active agents are *cells* previously existing in a structureless fluid called blastema, so in nutrition the end is attained by or with the help and continued energy of the *cells;* the materials of the nutritive process being present in the blood, *every tissue* and *every organ* attracts from it particles similar to itself. Nutrition, however, does not consist merely in the component particles of the organs attracting the fibrin, albumen, and other materials of the blood which flow through them, but the assimilating particles, through *cell agency*, must infuse into those newly added to them their own vital properties. Each *cell* that enters into the *formation* and *nutrition* of the different tissues is an independent organ, having a definite period of existence, and lives for itself and by itself, and is dependent upon nothing but a due supply of nutriment, and of the appropriate stimulus for the continuance of its growth and for the due performance of its functions until its term of life has expired.

In *decomposition*, or the continual waste which takes place in the tissues, and makes the supply of nutritive materials necessary, the drain is due to the continual disintegration, death, or destruction of the *individual cells* that have lived their appointed time. This death of the *cells* constitutes *molecular* death, in contradis-

tinction to *somatic death*, or death of the whole body. In these cells *every* tissue in the body has within itself the elements of life and of destruction. Such being the case, the necessity of an acrid substance, or a carneous body, to effect the disintegration and removal even of hard substances such as the osseous and dental tissues is not demanded; molecular disintegration fully accounts for it. The component cells having lived their appointed time, they degenerate, and their contents, assuming a fluid condition, are taken up by the venous or lymphatic radicals, neither of which can be looked upon as capable of breaking down any tissue; for the vessels distributed to a part, be they arteries, veins, or lymphatics, are but the *conduits* or carriers of nutrient fluids to and waste materials from the tissues.

After the various organs have obtained a definite size, as long as the two actions of *composition* and *decomposition* are harmonious, the repair being equal to the waste, the parts undergo no appreciable change of size or form; but if one or the other preponderates, *hypertrophy*, (due to excess of nutrition) or *atrophy* (due to deficient nutritrion) is the result.

Though generally regarded as the results of diseased action, either of these conditions may occur consistent with health. Thus the augmentation of muscle presented in the arm of the blacksmith or the leg of the ballet dancer, are familiar illustrations of normal *hypertrophy*. Exostosis of the fangs of the permanent teeth may also be mentioned as an instance of dental *hypertrophy*, which, though generally, is not always the result of diseased action.

As instances of *atrophy* occurring in the body as the result of a natural order of things, the Wolffian bodies, the supra-renal capsules, the thymus gland, the ductus venosus and arteriosus (vessels which are important in carrying on the circulation of the blood in the fœtus) may be cited. These organs and vessels having performed duties, some of which, if not all, are essential to the life of the embryo, and being destined for a temporary purpose only, upon the cessation of their special functions dwindle or disappear. Thus no trace of the existence of the Wolffian bodies can be found after the fifth month of utero-gestation; and the vessels so necessary to fœtal existence, after birth, shrink into ligamentous cords. The absorption of the fangs of the deciduous

teeth is but an illustration of *atrophy* of dental tissues, and the changes presented are analogous to the mutations that occur in the organs already referred to. The same causes that induce the one, effect the other. In each instance the explanation must be sought for in the modifying influences that control *nutrition*.

On this point as Paget justly remarks, in order that the process of nutrition may be perfectly accomplished, certain conditions are necessary. Of these the most important are:—

1. A right state and composition of the blood, from which the materials for nutrition are derived.
2. A regular and not far distant supply of such blood.
3. A certain influence of the nervous system.
4. A natural state of the part to be nourished.

Making special application of the preceding general principles to the subject under consideration it is necessary to present in the first place a *brief* description of the *development*, *growth* and *completion* of the deciduous teeth. In the development of the papilla of a deciduous tooth, the first stage is the formation of a *nucleated* cell, and the subsequent growth of the papilla is due to the multiplication and subdivision of cells originating from the parent cell. As early as the tenth week of utero-gestation, the twenty germs of the milk teeth are found in the primitive dental groove, and by the fourth month they are completely inclosed in separate cavities or sacs, this last act occurring in such a manner that *reserve sacs* are formed above for the papillæ of the twenty anterior permanent teeth.

By degrees the position of the *reserve sacs* and their inclosed papillæ is changed; from occupying a position above the deciduous germs, they retreat backward and downward until at last they are placed directly under them, and there eventually become surrounded by the bony alveoli. The dental germs here described are those that belong to the inferior maxilla; in the superior, the relative positions, of course are reversed.

During the period in which these changes occur, the deciduous papillæ, or pulps, increase in size, and assume the forms of the future teeth before the least deposit of calcareous matter takes place. If a *deciduous sac* is examined at this time, the *dental pulp* is found to be composed mainly of nucleated cells suspended in plasma, and a delicate connective tissue, similar to the hyaloid

membrane of the eye. A delicate, structureless membrane, the *membrana preformativa* (Raschkow,) in addition covers the pulp. Vessels and nerves are also present, the former being developed in great numbers when dentification commences, though they perform no other office than serving as conduits for a passage of the nutrient material, which escapes by transuding through their coats. Applied to the dental pulp like a cap is the enamel organ, which consists of an exceedingly delicate reticulated tissue, holding in its interstices a thick, transparent, albuminous fluid, in which peculiar nucleated or stellated cells are suspended. In the outer third of the enamel pulp a few vessels are presented.

The nucleated cells, both in the dental and enamel pulps, at first have no definite arrangement in regard to each other, but are scattered indiscriminately throughout the structure.

In the development of dentine, the first change that occurs in the pulp is the arrangement of the external layer of cells, end to end, in a linear direction. These elongate, coalesce and are converted into dentine by the gradual reception of calcareous salts. As soon as a portion of dentine is formed upon the apex of the pulp, by a somewhat analogous change in the enamel cells, the formation of enamel takes place upon and coalesces with the dentine. These two reciprocal actions continue until the crown of the tooth is fully formed. During this time a longitudinal growth of the pulp, and conversion, through centripetal calcification of the cells into dentine to form the root, also occurs. The tooth thus formed is forced up, presses against the gum, which is gradually absorbed and eruption is effected. After this the tooth is completed by the growth of the remainder of the roots. This is due, not only to the formation of additional dentine, but also to the development of the *cementum* which is formed from materials contained in the plasma furnished by the vessels of the periosteum. By centripetal calcification of the pulp the dentine is thickened, and the pulp cavity diminished in size.

In the tooth thus fully formed, the most ample facilities are afforded for the due nutrition of the dentine and cementum, by the transudation of plasma from the vessels of the pulp, and periosteum, through the dental tubuli, and the lacunæ, and canaliculi. For a brief season *repair* is equal to *waste*, and no appreciable

change takes place: but eventually a greater or less disintegration of these tissues supervenes, and the tooth loosens or falls out, or is extracted.

Exceptions to this rule, however, are presented, in which persons retain such teeth unchanged, and answering all the purposes of the permanent teeth for years—in some cases even to the fortieth year. Such teeth, though perfectly *firm* in their sockets and the roots *unabsorbed*, have frequently been extracted, under the impression that, having passed the period when they should have been shed, they prevent by their presence the growth and eruption of the permanent teeth; unfortunately for the patients, the looked for successors have entirely failed to appear.

Occuring, as the absorption of the roots of the deciduous tooth does, coincident with the development of the permanent it is reasonable to infer that the change is due to a modification in the nutrition of the organ induced by that cause: for no well authenticated cases are recorded of observations extending over a period of years in which the deciduous teeth have loosened and fallen out without sooner or later being followed by permanent successors.

To attribute, as some physiologists have done, the exuviation of the deciduous teeth to the fact that they have a definite period of existence, and when this has arrived they fall out as a necessary consequence, is not presenting an *explanation*, but stating a *fact*, to which there are many *exceptions*.

In seeking for the explanation of this phenomenon it should be remembered, as has already been stated, that the germ of the permanent tooth, after a certain period, occupies a position in close proximity to the roots of the deciduous tooth (separated by a bony partition;) in this position it remains for some time in a state of dormant vitality; at least with no increase in size. As long as this continues no apparent change takes place in the deciduous tooth; but eventually a new life springs up in the permanent germ; it draws from the blood the materials inservient to its *development* and *growth*, and in so doing removes from the current flowing to it and to the deciduous tooth, (through arterial twigs from the same main vessel) the constituents necessary to *repair* the *waste* that takes place in the latter. In many instances the supply is equal to the demand, of the permanent and de-

ciduous organs; and, under such circumstances, the development and eruption of the former takes place with little or no absorption of the latter.

In support of the position that atrophy of *hard* tissues may be induced by a deficient snpply of nutrient materials, it is only necessary to refer to the experiments of Chossat, who produced artificial atrophy and softening in the bones of animals, by restricting them to a diet in which no calcareous elements were present.

In addition to drawing to itself all or most of the nutrient materials from the neighboring current, as the permanent papilla increases in size, and the crown of the tooth is formed, it makes a graduated pressure, first, on the capillary vessels of the osseous partition and then on those of the deciduous tooth, thereby *diminishing* the flow of blood distributed to those tissues. By these two causes, not only the *quality* but the *quantity* of the blood sent to the deciduous tooth is modified, and absorption is favored. After the removal of the bony partition, the pressure of the erown of the permanent tooth may be either upon the vessels of the dental pulp or the periosteum of the deciduous. Of the effects of a *graduated* and *continuous* pressure in producing absorption of bone, the atrophied condition of the body of a vertebra ,that has been subjected to the pressure of an aneurism may be cited. In such a case, the pressure upon the capillaries of the periosteum does not cut off the blood entirely, (which, if occurring, wonld induce *necrosis*,) but merely diminishes the current so that the supply is not equal to the waste, and atrophy is the result.

Again, the influence of the sympathetic nerve in the function of nutrition must not be overlooked. Branches of this nerve are distributed alike to the pulp of the deciduous, and the papillæ of the permanent tooth, and there can be but little question that the development of the one and the absorption of the other is more or less dependent upon this nervous connection. Of the influence of the sympathetic nerve, in the nutrition of a part, the most striking illustration that can be presented is the experiment occasionally performed upon animals, of making a section of the ophthalmic branch of the trigeminus or fifth pair. In a few hours, or a day or two at the furthest, after making the section, inflammation of the conjunctiva takes place, ulceration is eventually established and the organ is completely destroyed.

Lastly, the fact must not be lost sight of, that the dental tissues are but a *congeries of cells*, constituting an animal matrix, in which the calcareous salts are deposited; that these cells have a different period of existence, and that by molecular disintegration they degenerate and are cast off. As the animal matrix degenerates cell by cell, their calcareous contents are liberated, and become mixed with the fluids to be taken up by the venous or lymphatic radicals. If in addition to this waste there is no supply of new material, atrophy is the result, and thus the roots of the deciduous teeth disappear.

In conclusion, these views are advanced under the conviction that the changes which occur in the dental tissues are in accordance with and controlled by the laws which govern the other portions of the economy; for in the language of the philosopher and the poet, all the operations of nature are governed "not by partial but by general laws." Upon the correctness of the views advanced it is not for the writer to decide. They are, however, his present honest convictions on the subject; but, wedded to no theory, and open to conviction, he would willingly change them to-morrow if satisfied that they are erroneous.

DISCUSSIONS.

Dr. Atkinson: I am very much gratified that this paper has been read at this time, and before I proceed to make any remarks as to the doctrine it contains, I wish to congratulate this body, and at the same time criticise or castigate them for not having paid more attention to such an excellent product of some fourteen years ago. I cannot say too many kind words and words of congratulation and thanks to my beloved brother McQuillen for the earnest effort that he made at that time to correllate and bring together in a presentable shape, the best authorities then pronounced, as far as I know: but then or now it will not do for us to talk of function and stop at cells, for we are as much at a loss to understand what the absorptive process is by simply understanding all that is nominated in the term "cell" if we stop there and do not inquire if there is something below that, as we are if we stop at "organ" or at "system," and that, I think, is the point that should attract our attention and engage our best efforts continually, as a new body, somewhat relieved from false precedents.

It is unfortunate to us that the term molecular metamorphosis has obtained such a world-wide acceptance, because it is not only molecular metamorphosis, but it is granular metamorphosis, and granular metamorphosis is that which breaks down cells; molecular metamorphosis is that which changes the fluid protoplasmic mass out of which granules themselves are formed, which takes place under the law of the activity of special combinations of affinity, subsisting in the elements of the molecules out of which protoplasm itself is constructed, and until we get right upon our knees and stick our noses into the very territory of the activities that we are speaking about, the function of modes of motion, we shall never be able to do anything more than pronounce mouthfuls of incongruous apprehensions, and we shall know no more than that the tooth was "absorbed", as they say.

It is very unfortunate that they should ever say that the deciduous root was taken away by absorption. What is absorption?

It is simply bringing to fluid again what had already been made fluid before it could go there, and that might as well be done in the presence of a carneous body and by the agency of a carneous body as anything else, if we were begining *de novo*, but that is not our situation; we are under law, and we are now investigating operations that present themselves to us in bodies capable of being seen and being improvised and misinterpreted.

Prof. McQuillen said "function was not a matter of microscopical observation. That is just half true and half not true. Because we cannot see the very origin of modes of motion and go to the last analysis of all the courses, down to final causation, therefore that we should not go any way in the chain, is precisely the point of difference between the so-called "physicists" and "spiritists," who account for the different formations of the different bodies with which we come in contact, in nature, when we are studying physiological activities.

I wish to give a nomination, which perhaps will be new to some of you, so that we may get at the apprehension of what is before us. The Doctor very beautifully slipped over a whole world of truth, in a manner very common among naturalists, in speaking of metamorphosis and of the germ of cell-life. What does that mean? Until we go back to atoms shall we ever know what that does mean, and understand how atoms become formed together by a satisfaction of bonds of affinity, making molecules, and molecules by an irregular combination formed together in an irregular mass called granules, and how a regular arrangement of cells produces tissues, and a regular arrangement and correllation of tissues produces organs, and a regular posit of organs and an arrangement of them produces systems? Now where are we? We must go back and see what this alteration of generation of cells means. We must go in and behind the cells to know how they generate. We start with atoms. There are thirteen kinds of atoms that enter into the human body; but the basal ones are C, H, N, O, and it is because of the changes of the relation of these to each other that the atoms present us with molecules, and these are the bases of nutrition everywhere, and it is by virtue of the endowment of power in the above that we get any functional activity whatever.

Every time we deal with the cell we are dealing with the com-

plicated modes of motion that may be the result of full or partial satisfaction of the bonds of affinity resident in atoms, whereby they will be combined one with the other. Water is one example. It will not be water if it is not H^2 O. Any other combination of hydrogen and oxygen will be something besides water; but the instant that two measures of hydrogen and one measure of oxygen shall be brought into that known or unknown relation, by which their inherent affinities can express themselves, they cease to be what we call gases and become fluid. In their coming together they make molecules, so that the smallest speck of water you can get is a molecule, and not an atom; and there is where speakers continually make mistakes and call things by improper names.

As I said, satisfaction of affinity in atoms produces molecules, and irregular combinations of molecules produces granules, and they are the first bodies capable of being seen. We cannot see an atom, and we cannot see a molecule as such. They must grow to the size of granules before we can get any arrangement; then as soon as they are arranged into the form of cells we begin to differentiate them, and understand how it is. These are all made out of the protoplasm, or the molecular mass that is capable of making molecular aggregations, and the law of the bonds of affinity being exercised satisfactorily or acceptably, we get a healthy protoplasm, and there is no retrograde metamorphosis, either, because that is an ante-grade metamorphosis, and anything short of a full satisfaction is pathological in the degree of the minor expression of satisfaction. Then we may have sickly granules. If we have, we cannot have healthy cells, and if we have sickly cells we cannot have healthy tissues, and if we have sickly tissnes we cannot have healthy organs, and if we have sickly organs we cannot have healthy systems.

I know many patients between the ages of twenty-five and sixty who have their temporary teeth still fast in their jaws. They say it is the advancing tooth that causes *absorption*. Why absorption? First *solution* before *absorption* always; why not then say *solution* of the calcareous shell that holds the germ of the permanent tooth in it? Here is a relation that we do not understand—some develop to a certain extent and stop, and others develop entirely to the complete development of the teeth

without being erupted at all, still leaving the roots of the temporary set intact, connected in all their ways, so that the circulation is going on. It is the machinery of circulation that we have dwelt upon continually, supposing we had got to the foundation of functional action, and had traveled the world of causation; and we have been dealing only with the machinery—with the implements of function. Now what is function? There is where we get into the quarrel. Who stands there to say when there is enough of these cells deposited to make a complete muscle or other tissue of any kind? Why, that master builder, the little typal presensce, that says there is enough when you have four fingers and a thumb, and we see, when that is disturbed, sometimes five fingers: so that we must deal with these deep and hidden causes of combination of affinity before we can get at anything like function.

Now we are exactly at the poimt where physicists and spiritists disagree, and we must resolve ourselves into both before we can get at the truth, and I will give you the name of "dynamic atoms," and when we understand dynamic atoms and physical atoms we can go on and talk of function. The nervous system set off against the vascular system will exactly be accounted for. We have the positive neural blood, so to speak, that is the representation of the dynamic side, and we have the negative vascular blood, which is the negative or physical side of organization, and when we shall understand how these come together and what kind of food ministers to the full preparation of the pabulum of the dynamic molecule and the pabulum of the physical molecule, we shall be able to get something toward what causation is; but until we do that we shall spend a great deal of time on old nominations that we shall be sorry that we ever learned, because we shall have to unlearn them; and I would advise any of you who desire to study microscopic anatomy, never to read Schleiden and Schwan, for they will be stumbling blocks—rocks of offense in the way. You had better spend two nights with Dr. McQuillen over a specimen, and read the book of nature, and you will not have differences of opinion and differences of presentment because you are looking at different things.

Dr. KNAPP: I was very much pleased with the report that was read on this interesting subject, and glad to notice that some

of the quotations were made from the very excellent authority on dental physiology, Mr. Tomes. The writer, however, omitted one important fact put forth by Tomes, and verified I believe by the observation of nearly every dentist who has had opportunity for observation, namely, that there is no absorption known to take place in a deciduous tooth after the loss of the vitality of the pulp. The writer of the report stated that absorption of the roots of the deciduous teeth take place in a measure, not so fast as is characteristic of teeth with living pulps. I think that whenever we extract a devitalized tooth of the deciduous set and see that some absorption has taken place, it is no proof to us that that amount of absorption did not occur previous to the loss of the vitality of the pulp. I believe it is a well known fact at the present time that the vitality of the pulp is essential to the process of absorption.

Dr. JUDD: I have but few words to say on this subject, and I shall confine my remarks to the subject of absorption, speaking of absorption, however, in the usual sense. It is true as Dr. Atkinson said, that the original sense of the word is, to suck up or take up, but at the present time it usually comprehends a little more, and it is getting to be used by a great many authors in a sense in which it comprehends, likewise, the breaking-down process of the hard tissues. Keeping in mind this idea, which seems to be growing in the use of this word, I shall not be misunderstood; and I wish to speak simply in relation to the differences between *atrophy* and absorption, for I apprehend they are two entirely different processes. As I understand atrophy and as I understand the term absorption, there is in reality no especial connection or analogy between the two. In speaking of atrophy as I understand it, we mean a molecular disintegration that is not recompensed by progressive metamorphosis. We know very well that in the living tissues progressive metamorphosis and retrogressive metamorphosis are constantly going on. You arrest the process of nutrition and the retrogressive process still goes on, and we have true atrophy in such cases as that.

Now, in the case of absorption as we understand it, when we speak of the absorption of the roots of the deciduous teeth, we have as it were a cutting away of the whole tissues, and not simply a removal of the molecules within a tissue. There is a cut-

ting away of the whole root, an entirely different process, not a shrinking down of the root, as we find in soft tissues that are atrophied, and therefore I say it is an entirely different process.

I speak of this because I believe that Dr. McQuillen still holds to the same doctrine that he taught in that paper, and a very admirable paper it was for one which was written fourteen years ago, in relation to this doctrine, and in combating the idea that was brought out by the paper that was read by Dr. Dean, he asks the question, whether or not in the hollowing out of the medullary cavities of bones, etc., there is any carneous body there to produce this absorption of the bony tissues. If I understand Kölliker in his remarks before the German society of physicians, at Vienna, in which he brought out this doctrine of the breaking down of the roots of teeth by means of ostoklasts,—not that he originated it there, but in which that was a prominent part of his argument, I understand him to claim that in all cases of true absorption of bone and of teeth these ostoklasts are found; that there is a veritable carneous body in every instance. It does not however, it seems, present the exact appearance that we see in the case of the deciduous teeth, where there is a compact solid mass of cells, but these ostoklasts (which differ essentially from the ostoblasts, or those that build up the tissues,) are always found, according to the doctrine which he brought forth in his paper, and his remarks upon the subject, as I understand them, were principally to bring out this fact as something in advance of that which had been heretofore known.

It struck me that this was a point of considerable importance. If this be true it is a considerable advance upon our former opinions and theories in this direction; not by any means that it explains everything in relation to this process, but we are constantly getting nearer to the gist of the matter; we have passed at least one step in advance if we discover and demonstrate that wherever the absorption of hard tissues take place these ostoklasts are always found.

There was one question that Kölliker touched upon in that discussion, and it was discussed at some length by other members of the German society, and that was in relation to the origin of these "giant cells." That question, as far as it has been investigated, leads us into a mystery that they have not been able

thus far to solve, as we ever find it almost, when we tear aside a veil that covers up one thing that has hitherto been hidden from our sight, we only reveal still further mysteries. We want to go on now and resolve these other mysteries which the explanations that Kölliker made have only brought to view.

SOME OBSERVATIONS

ON

Diseases of the Enamel.

By HENRY S. CHASE, of the Committee on Dental Pathology.

NOTWITHSTANDING the compact structure of this substance, it is in early life subject to inflammation, and malnutrition, and at later periods, though not manifesting the same signs of inflammation that are exhibited in softer tissues, yet undoubtedly it does go through some of the movements which result in inflammation and *death* of the tissue.

During the development of the permanent teeth, and before their eruption, or even after eruption, all those portions of the dentinal crowns which are still covered by the gum, or within their respective sockets, are peculiarly liable to be injuriously affected by skin diseases accompanied with much fever. Scarlet fever, small-pox and measles leave their impress upon the enamel with the greatest certainty. The enamel organ participates in the dermoid inflammation, and the enamel prisms cannot easily escape. The delicate sheath which envelopes every prism, being of the same histological structure as the enamel membrane itself, is easily affected, and every prism undergoes inflammation. These delicate sheaths constitute the *basal* structure of the enamel. It is into these cells that the fluid phosphate of lime is invited, and becomes crystalized. Upon the severity and extent of the inflammatory process depends the appearance and physical condition of the enamel after the tooth is erupted. Let us keep in mind that at this period cell life is in the greatest activity, in all parts of the body. Work is going on incessantly in every organ, and every

tissue. *Building* is in progress, but if the workmen are sick the process is arrested. When there is *general* disease the appetite fails; digestion suffers; food is *not* made into pabulum; protoplasm is deficient, and there are no *materials* for building, even if the builders were able to work. So here, in the teeth, if nutrition is arrested then *absorption* only is active, and a line of depression will show around the tooth after its eruption, marking the exact degree of development attained by the tooth at the period of sickness. The width and depth of the furrow will also correspond to the length of the sickness and its severity. Wool of sheep, hair, and nails show the marks of defective nutrition, caused either by sickness or a paucity of food. I have to-day (July 15th,) a depression or groove running across each thumb-nail, caused by a fortnight's illness in March. The grooves or depressions so often observed on the incisors and other teeth, are the result of arrested development. The white soft chalk-like spots on the enamel are caused by inflammation of a small number of enamel cells while their contents of phosphate of lime were yet uncrystalized. Stasis resulted and the lime salts, in that chalky enamel, are to-day not in such a state of crystalization as is produced by healthy vital action, consequently there is no firmness or density to the tissue.

That enamel which appears seedy or granular, and is yet *hard*, was produced by inflammation and consequent shriveling of the enamel membrane *after* the enamel cells had partially crystalized their contents. In healthy and naturally developed enamel there is a free circulation of the blood plasma, through every enamel cell membrane; not by vessels of course, but through osmotic action, such as takes place in every part of the body, at a greater or less distance from arterial vessels. The activity of nutritive movements depends on the age of the individual; for it is well known that as age increases, nearer and nearer a static condition is reached, which at last may become nearly perfect in some of the hard tissues, as doubtless it is in the enamel. It is important that we keep these facts in mind when we are making observations upon the teeth after eruption. Every *experienced observer* knows that all the hard tissues of the teeth are in a state of greater or less mobility before the fifteenth year; and the writer believes for a long time afterwards. The enamel, before this

age has not upon its exterior that vitreous appearance that it assumes later in life. The latter is owing to a more perfect crystallization of the lime salts. As we extend our investigations deeper into the enamel substance towards the dentine, we find less and less compactness, for that part lying next to the dentine hardens later than the exterior portion. The exterior is always in advance of the interior. The same remarks will apply to the dentine; but in the *latter*, nutritive changes take place to a greater extent, and more rapidly than in the enamel, just as might be expected, for it is a softer tissue.

A large number of observers have demonstrated that absorption often takes place in the dentine, and a smaller number have also demonstrated that it does in rarer cases in the enamel itself.

We have seen that inflammation of the enamel membrane, before eruption, causes necrosis of that tissue; and now we wish to see how that pathological result may be observed to take place in the enamel of teeth already erupted. Let me tell you what I have hundreds of times seen, and then we will try to arrive at a theory which will explain the phenomena.

I am looking into a fifteen-year-old mouth, and I see the anterior surface of a right under first molar. It is smooth and vitreous in appearance, and has *no* abrasion or crack in this surface. But there is a whitish spot near the centre of this surface. It is *off* color; it has lost its polish; it cuts like rock salt; as I penetrate further it cuts easier and easier, until I arrive at the dentine which latter is as hard as we find it at eight years after eruption.

I see the same tooth in a person aged twenty; the spot is brown instead of white; it has a vitreous appearance, smooth and without sign of disintegration; it cuts hard at the *surface*, but immediately under, the thickness of tissue paper, it is pliable and chalky, and when the dentine is reached, the latter is found more or less softer than natural; apparently decalcified, and a considerable portion is found bounded by harder tissue.

I see the same tooth and surface in the mouth of a person aged twenty-five; the spot is black, vitreous suface, but no disintegration, no roughness; the blackness penetrates the enamel; shading off into dark brown, until it reaches the dentine, where it still shades off into lighter brown, until the natural color of the healthy dentine is reached. This spot cuts at first like feldspar,

then less dense; not porous, but before reaching the dentine becomes so; afterwards like dry hard wood across the end of its fiber; finally shading off into the natural density of dentine. The previous condition of this tooth was that of *pressure*, caused by one now extracted. This is not a case of caries, or chemical decay, but one of arrested circulation in the enamel fibers, followed by *stasis;* and this extending to the dentinal tubes by inflammation as a cause, and the calcification in territory next to the one of stasis.

Spontaneous abrasion or denuudation can only be fully explained by a theory which covers the whole ground that I have partially gone over, namely, that vital action plays an important part in all pathological conditions, both of the dentine and enamel. If those who disbelieve this play of vital action in erupted teeth will take the trouble to look into the literature of the subject, they will find many cases recorded which illustrate and confirm its truth. In "Wedl's pathology of the teeth," he has cases recorded instances of united fracture of enamel in *adults*, besides many similar cases.

DISCUSSIONS.

Dr. Atkinson: This subject is one of such manifest importance that every man here ought to wish to speak upon the subject, if nothing more than ask a question, to prove that he is in earnest to get at the understanding of the calling by which he makes his bread. The subject is a continuation of that which we have been discussing, and the paper is full of statements that are gratuitous, and we have to supply some ellipses that he has left in his statement of the facts. He says that the hardening of the dentine takes place from the periphery inward. If he means the action that takes place by infiltration of lime salts into the imperfectly formed spots of the dentine he is correct.

Something he said with regard to skin diseases. In a general way that is true, but he said that the enamel was a dermal pro-

duct.* I am sorry for him; I am sorry for the world if they do not get along any better than that. Enamel is epidermal, dentine is dermal, the pulp is hypodermal in its origin, and this correllation of parts holds good throughout. If we speak of enamel cells and enamel prisms, then indeed, we are talking intelligently and intelligibly; but these points must be understood before we can comprehend that, and further than that, the enamel is complete at about the time that the second or third ring of dentinal fibrils are formed below the neck of the tooth, so that the enamel or the materials may be washed away, and these white spots that he speaks of may be the result.

It is a pretty good stretch to say that the intertubular portion of the dentine can be inflamed. I doubt whether it is legitimate to say that inflammatory action can take place outside of the dentinal fibrils.

Dr. Judd: I agree with Dr. Atkinson in relation to the paper, where he states that there are statements made that are entirely gratuitous; not but what they may be correct; and I shall refer to some statements particularly, and a few that I think may be incorrect. In relation to the inflammatory process that is carried on within the enamel, and the process that is so well marked out there, and the subsequent changes that take place, he attributes, without any doubt whatever it seems, to an inflammatory action. You will recollect that I have always objected to such statements before this body. I have no objection to a man arising here and telling us what is his opinion on this or that subject, but I do object in all our papers of that kind, to statements that cannot possibly be demonstrated by any experiment, and never have been or proposed to be demonstrated, and set down as an undeniable fact, simply because the man who wrote the paper thinks so.

I suppose this is the only paper we are to have upon pathology, as far as I can learn, and it opens the door to the discussion of anything of a pathological nature that may arise, and without going into a refutation of the doctrines in the paper. Indeed, I do not wish to refute most of them. I wish to state some few facts relating to doctrines that are brought forth, and some that

*[Dr. Cushing, who read the paper, called attention to the fact that the statement of the paper on this point had been misunderstood by the speaker.]

are not brought forth in the paper perhaps, in relation to the idea of the gentleman that there is circulation in the enamel. We must confess that he is going further in that direction than most physiologists of the present day would be willing to go. The word circulation, at any rate, to my mind does not seem to be the proper word here, even if nutritious matter does penetrate the enamel itself, it is a permeation of the nutritious matter, and it certainly cannot be anything more than that. You take a piece of marble for instance, and throw a little water upon it, and it permeates the marble; you take a piece of common limestone that will not take a polish such as marble does, and it permeates it much more readily. The enamel certainly can be permeated by fluids; there is no question in my mind about that, and I can account in no possible way for the condition which we speak of as "setting the teeth on edge," except by the permeation of the enamel by fluids.

In relation to the permeation of these tissues by matter, and the penetration of the enamel by nervous fibres I wish to say one word. I am not going to put forth the doctrine as established by any means. You all know that for a long time it was supposed that nerve fibrils did not penetrate the sheath of the muscular fibre, but close examination under the microscope demonstrated that they do penetrate into the interior portion of the muscular fibre proper. Another doctrine was that they did not reach into the epidermal structures, but subsequent closer observations show unmistakably that they do penetrate into the epidermal structures and between the epiderm cells, and they do in reality reach the very surface of the epiderm itself.

There is another question that is hinted at in the paper in relation to the abrasion of the teeth, and at the time it was mentioned a thought struck me in relation to that. Perhaps I have spoken before this association before on this subject; however that may be, it is a subject that I have thought a good deal upon; and the question arises what are the pathological conditions in abrasion and caries? Why is it when we have a destruction of the enamel by abrasion that we do not have caries in that location? I believe that in cases of caries that the shaping of the cavity, and the direction of the action of the disease towards the pulp particularly, is due to the influences of other agencies be-

sides acid. There is certainly something besides the action of acids here to account for the direction, the shape, the formation of these carious cavities. We must have something else, and I am inclined to think—I don't say it is demonstrated—but it is my opinion that we have to deal with the *leptothrix buccalis* here.

Dr. Bogue: I have jotted down within the last few moments the heads of what might he said upon this subject. I have no written paper upon it.

The frequent use of the word nerve by dentists, when the pulp is meant, leads one to believe that some of the more obvious changes that take place in this pulp in nearly all cases are overlooked. If the body within the tooth were really a nerve there could be no such pain as tic-douloreaux, the jumping toothache, since this manifestly proceeds from engorgement of the circulatory vessels of the pulp to such an extent that the beatings of the heart are felt by the nerves of the pulp. Sequences of cause and effect in the usual form of toothache may be stated as follows: First, irritation, which in different persons manifests itself differently; but I fancy in nearly all it would manifest itself by sensitiveness, and it scarcely needs that your attention should be called to hyper-sensitive people to know how quickly they are aware of cavities existing in the teeth, sensitiveness being caused of course firstly and most largely by decay, again by abrasion, again by fracture, and in other instances by recession of the gums and alveoli.

Not to speak of the more unusual cases, but to proceed at once to the very common cases as the only ones under examination, the second state would be that of inflammation, which would exist where the pulp was nearly or quite exposed from decay. The presence of any irritating substance within the cavity of decay, causing pressure upon the pulp, would necessarily cause inflammation there. Why? If we irritate any portion of the body we know that an increased flow of blood is immediately apparent. The same thing I believe takes place when the pulp of the tooth is irritated, and when the irritation has proceeded to a certain point inflammation supervenes. We then have, not the dull pain and sensitiveness, but the acute pain, which the patient describes as toothache. The more intense the pain, the more rapid

the flow of blood to the part, the throbbing of the heart being felt up to the very last moment, when the pulp is being gorged to the utmost and strangulation takes place; the pain ceases immediately.

In looking at the question from this standpoint, if it be a correct one, I think we may see how we may be of service to our patients in relieving the pain all along this road. The first irritation or sensitiveness, of course, is at once relieved by filling with a non-conductor; when the irritation has become greater, verging on to inflammation, I believe the proper course is to find the point, and prick it and let out a half drop of blood, and relief will be almost instantaneous. I have many times succeeded in giving relief within two or three moments by depleting the pulp from two to three drops, scarcely ever so large an amount as the latter. Unfortunately our patients are not aware that relief can be afforded, and they wait for the toothache to cure itself. There is a self-cure: that self-cure is death to the pulp. What next? Immediately supervening upon the death of the pulp in these ordinary cases we have putrefaction and disintegration, resulting in the conversion into gases of the fluids and soft-solids of the pulp, sulphuretted hydrogen and oxygen are mainly developed—these gases occupying of course greater space than the solid portion of the pulp in conjunction with decomposed and decomposing fluid substances. We here at once have a foreign substance placed beneath the peridental membrane, requiring but the proper condition of things in the system to develop an abscess.

Dr. Morgan: That the enamel is a vital structure I suppose will not at this day be questioned. Every analysis I believe that has been made shows that there is at least a small portion of animal matter, and if so, it must of necessity be subject to the same law that animal matter is in the other tissues of the body, viz.: wear, and death, and removal, and a supply of its place. It may be that this vitality, this animal matter only exists in the connective tissue that remains between the prisms of the enamel.

I have not yet satisfied myself that there is sensibility in the enamel. I have yet to see a case of the setting on edge as it is termed, where I was satisfied the enamel was perfect. I think sensibility only resides in the dentine.

It is known to all who have freqently examined specimens

through the microscope, that in a good many cases, especially in young persons, the dental tubuli seem to penetrate very far into the enamel, and in some cases entirely through it. The microscope reveals the fact that there are little passages from the surface into the dental tubuli in a good many cases. In these cases you may have sensibility from the effects of the acid, that sensibility being confined to the dentine, and not involving the enamel at all. I agree with the gentleman that the enamel will absorb fluids. A tooth taken from the mouth and remaining a few hours on your case will show that it has undergone material change by its color. The immersion in water or any other fluid will restore that color.

Dr. TAFT: The paper read last night upon the abnormal and pathological condition of the enamel was, in some respects, a good one. This tissue is a very important one, and it should be studied in all aspects in reference to its normal structure, and in reference to the abnormal conditions which it is liable to take on, that may occur to it, either hereditarily or accidentally. There is a great variety in the structure of the enamel, occasioned by one thing or another. It is very rarely that anything approximating an enamel perfect in structure is found. Some defects are transmitted from parent to child, others occur because of accidents or interruptions in the development and nutritive process during the time of the formation and growth of this tissue. Oftentimes there will be an absence throughout the entire structure of that perfect crystalization that characterizes the best examples; then again there will be defective tracts or points in the structure. Some of these were referred to by the paper last night, and by the speakers. These will sometimes manifest themselves in the points denominated atrophied portions or those parts of the enamel where the nutritive function was arrested to a greater or less extent during the formation of the tissue by some active disease, occurring for a time, and marking itself upon the enamel, markirg itself upon the nails and upon the hair, as was mentioned last night. This class of defects will be shown by spots differing in color from the better formed enamel round about. In some cases they are found to consist of grooves, in other cases of a series of transverse points across the enamel at the points in formation at the time of the affection. Then again there will be

found oftentimes imperfections of the enamel in the fissures where there will be an opening.

There is oftentimes an opening in the fissures of the enamel, the crowns of the molars for example, the lingual surfaces of the superior incisors, especially the central, and sometimes the lateral, and sometimes the cuspids, opening through these depressions, extending partly and in many cases all the way through the enamel to the dentine. Then again there is another class of defects of the enamel, exhibited by marked defective tracts or channels through the enamel, either partly or all the way. These will begin many a time at the inner surface of the enamel; at that portion of the known dentine and extending all the way through or only part through it.

These tracts are entirely different from the defects found in the fissures and in the pits of the enamel. They may occur anywhere and are oftentimes, perhaps as often as otherwise, found in the enamel, and coming out or pointing towards or terminating upon the cusps of the teeth.

Sometimes decay will begin upon the cusp of a tooth or at any particular point and permeate the enamel, and a definite opening will be formed by decomposition through the enamel, and the wonder oftentimes is how that occurs, since nothing could be deposited there, as ordinarily deposited upon the approximate surface of the teeth, or as is oftentimes forced into the depressions and pits of the teeth and retained there until decomposition of the material takes place, and agents produced that will occasion decay of the enamel. Decay beginning on the cusp and passing through a small opening to the dentine, decay of the dentine will take place. These tracts, especially where they are definitely marked and amount to an opening or passage through which fluids may readily pass, will afford great facility for the operation of decay-producing agents.

There are other defects of the enamel that pervade the whole structure. These will be exhibited by that imperfect character of the enamel throughout, sometimes presenting a structure almost without any organic character at all, simply the materials thrown together in a very imperfect manner, and this condition will oftentimes pervade the whole structure of the enamel; then again in some cases the dentinal fibrillæ will be found to extend from

the dentine into the enamel to a great extent, and sometimes, as was stated last night, entirely through the enamel to its periphery. I have a specimen which I should have brought with me this morning—a photograph by the late Professor Hitchcock, showing this clearly, where the largest number I have ever seen of the fibrillæ pass from the dentine through into the enamel.

It is impossible here to go into anything like a thorough examination of detail in all these particulars, and indeed I do not believe that this association is the place to study to the bottom all these subjects. If we can talk about them and stimulate each other to a further study of the subject and a further investigation of the matter we shall have done about all that it is possible to do in a body like this. These structures should be well studied in all these particulars. All the witnesses that are present should be examined, all the peculiarities that exist should be noted in order that we may ascertain how much these different phases modify the treatment that should be given to the different teeth.

When disease attacks the body it leaves tracks upon all the tissues of the body to a greater or less extent, and especially upon those upon which its force is most definitely expended. It is true that we cannot look upon the face at once, perhaps, with our present knowledge, and say, you were sick at one time, you were seriously affected at one time in your life, during a time of growth and development; but perhaps a time will come when we shall see more clearly than now. These impressions made upon the teeth bring to us a lesson in this respect, and it ought to encourage us to study all the tissues of the body so that we may be able to read from them the difficulties and struggles through which the organization has had to pass, that we may be able to learn how they are now able to withstand the assaults that may be made upon them.

Then let us study the enamel in all these particulars and many others that I might mention; let us study the dentine, for there is quite as large a field for investigation in this particular as in the enamel. It is true the dentine does not stand out in a well formed and covered tooth, to the observation, but the lessons taught by the enamel may lead the thorough physiologist and histologist to conclusions in reference to the condition of the dentine, whether it is more or less well formed.

The dentine possesses many peculiarities, abnormal and pathological in character, that it is well for us to study. Variations will be found all the way through. It is true that this variation in the elementary structural character teaches to us the lesson that they are, in different degrees, able to resist the influences that might be brought upon them. All that should be recognized clearly by us in reference to the teeth, and not only in reference to the teeth, for we cannot study these things with reference to the teeth without being led to discover them in the other tissues of the body, and understand them so that we read the whole book instead of reading one page of it.

One thought more with regard to the defects of the enamel and dentine. In studying them it is well for us to make our analysis as close, and criticise as sharply as possible, and every defect that is found upon the tooth should suggest the inquiry, how comes this difficulty, has it come from parent to child through successive generations of people, or is it an accidental thing that has occurred by some interruption of the developing process during the time of the growth of the organ. This is a very important matter to decide. If it is found to be hereditary, there will be far more difficulty in eradicating it. If defects of this kind have occurred and they have resulted from some accidental cause during the growth and development, we shall not expect to find that transmitted to future generations; the offspring of such a one will probably not partake of that defect. They may partake of it, and they oftentimes do partake of it, but there is not the same certainty of transmission of the defect as though it had come from parent to child through successive generations, but though that has been true we are not to give up the case and say nothing can be done. Let us endeavor to redeem so far as possible even these defects and these imperfections that have been transmitted from parent to child.

Decay of the dentine was referred to last night, and the parasitic theory was spoken of. I have not been able to work myself up to any great degree of interest in that respect, not much more than I would to examine into the fact of the existence of the little animals that pervade the dead carcass after it has been dead for some time. Living animals are found in the dead carcass after life has gone, but they were not the cause of the death.

They exist there after the animal is dead, and I think this is about the case in reference to the teeth. I have not been able to see anything to lead me to the conclusion that parasites play any considerable part in the production of decomposition of the dentine. I know there have been many suggestions in reference to this matter and the fact of usually finding something of this kind in connection with decayed teeth has been regarded as evidence that they play an important part in the process. Because worms and bugs are sometimes found in dead and rotten wood I do not therefore conclude that they were the occasion of the death and decomposition of the tree, but they are there because that condition has occurred, and they are there after life has departed, after the functions pertaining to it have ceased, after decomposition of the structure has to a certain extent occurred, they are present and not until that time; and so I regard it in reference to the teeth. So far as they may inherently belong to the material that occasions decomposition of the teeth, they may have connection with the matter, but no further than that as it seems to me.

Now it is true that in some materials, living beings, living parasites will be found almost always, and such will be their natural abode, and this may be true in regard to some of those things that produce decomposition of the dentine.

How does decay of the teeth penetrate into the dentine? Very variously indeed; sometimes beginning upon the surface and extending over a large territory, not penetrating deeply at all, sometimes becoming arrested when it has operated merely superficially, sometimes it will extend largely beneath the enamel, between the enamel and the periphery of the dentine, affecting the dentine very little, but burrowing beneath the enamel, between the enamel and the dentine. In other cases it will make a strike like a shot, as it were, through the enamel and through the dentine, by a very small opening, and penetrate to the pulp chamber. In other cases it will burrow down to the dentine, penetrating as it goes until it involves nearly the entire crown of the tooth before the pulp-chamber is reached. Why these variations? There is, as you who have given any attention to the subject all know, almost an infinite variety with regard to the manner of penetration of decay, and it is easily accounted for. Decay may attack the enamel or the enamel be destroyed from one

cause or another. The granular layer, or that material between the enamel proper and the dentine, varies greatly, and that structure ought to be well studied by us. It will be impossible for us, without a study and a knowledge of this structure, to understand this subject of decay, and the various affections that attach to the teeth. The structure is sometimes exceedingly thin. Sometimes the perfectly formed enamel seems to lie down almost directly in contact with the perfectly formed dentine. In other cases there is a thicker portion very imperfectly organized between the two, denominated sometimes granular layers. Now where this is very imperfect, decay-producing agents will operate upon that far more rapidly than upon either well organized enamel or dentine, and so decay will be found running largely beneath the enamel, not penetrating deeply into the dentine, but occupying a large extent of territory over the periphery of the dentine. Suppose this structure or this material is good in character, and a well formed enamel comes down upon the more perfect structure of the dentine, and there is very little space there indeed to be operated upon, and the dentine is imperfect, this penetration into the dentine will take place, and if there is an imperfect tract in the dentine, as there often is, as well as in the enamel, they become penetrated by a small opening down into the dentine and through it many a time into the pulp-chamber. Sometimes decay will penetrate to a considerable distance toward the centre of the tooth on the line with the tubuli of the dentine, penetrating to a considerable distance, and seeming to be arrested, and then it will sometimes turn out of its course across the fibrillæ, be arrested in its course towards the pulp chamber and pursue some other course. It operates upon the tissue, which is most easily broken down, so that all the peculiarities observed in the progress of decay, in its penetration through the enamel and into the dentine are easily explained it seems to me.

I do not imagine but that in many cases there is a concentration of the agent, producing decay at one point in a cavity when in any other point of the cavity it would not act with such force. It may be active at one particular point even within a small cavity, and less active at other points. In the production of decay-producing agents decomposition and recomposition take place. That may exist all through the cavity alike or there may be a

particular point where this decomposition and recomposition will take place at a small point and not be active elsewhere. Just where that takes place of course there would be the greatest action of the agent produced upon the dentine.

I have examined this subject of decay of teeth with reference to these theories that have been suggested with regard to parasites, from the beginning almost to the present time, and as I said in the beginning, I have not been able to find anything that comes with any force, anything approximating demonstration that parasites play any part at all. I do not want what I have said to be taken and criticised as a thorough examination of this subject. I have simply referred to a *thing* here and there merely to drive down a stake here and there with reference to the matter. It is susceptible of being discussed and made clear and plain all the way through it seems to me, comparatively so at least.

Dr. SPELLMAN: With reference to this subject under discussion I beg leave to remark that recent histologists, I believe, discard, or very many of them are discarding the animal theory that has been advanced here and are substituting for the same a vegetable or fungus theory. Some of my hearers no doubt will hold that the development of this leptothrix ultimates in the production of these parasites. As I understand the present theory of microscopists, and I refer to a recent work published by Lieber and Rottenstein, they discard that theory entirely; they deny that parasites are necessarily the result of this fungous growth. In every stage of decay they find these leptothrix attaching themselves to the enamel, as the lichen fastens upon the body of the tree, or the sponge upon the rock, and acids finding a ready receptacle they act upon the lime salts of the enamel, causing the same to break down. As soon as this decomposition of disorganized enamel takes place, the enamel is penetrated and exposed to the action of the acids which are held in contact with them, by the development of the leptothrix, and penetrating parallel with the enamel rods finally reach the dentine. Then the leptothrix find lodgment in this debris, and it then has soil in which to develop itself into full growth. The shape of all decay, I need not tell this assembly, after the penetration of enamel, is directly in the direction of the pnlp, and this development of the lep-

tothrix is carried on by the parent throwing off spores, these spores taking lodgment in this pabulum, forming a connection with the parent stem and proceeding in this way until the complete destruction of the tissue or dentine, when the pulp is exposed. This as I understand it, is the theory of the most recent and learned histologists. I do not understand that it is necessarily a parasite operation by any means; but the growth of a vegetable fungus.

The fluids of the mouth are capable of maintaining and supporting a vegetable product peculiar to their own nature. The most recent, and to my mind the most reasonable theory is that the leptothrix is the product of the secretions of the mouth, and their cause in the development of *caries* has not been fully understood nor developed.

Dr. WATT: Years ago, in the mouth and out of the mouth, I produced artificial caries, imitating all of the four varieties, precisely every form of dental caries that I have ever seen in the mouth, or that I have ever heard described or read descriptions of. Months in succession I have had mouths *rented* that had a few remaining living teeth that were sometime to be sacrificed. You all know that I have not concluded that I was master of all subjects, and the microscopical examinations I have entrusted to other parties, and they did not find these little bugs or whatever they are called, and I think they were not there; at any rate I was not particularly concerned if they were there.

The white decay is the most penetrating and makes the rapidest reaches for the pulp cavity. You will nearly always find that in the mouths of patients who ordinarily have an alkaline reaction of the fluids of the mouth, most, if not nearly all of that alkalinity is due to the presence of ammonia, which is highly soluble in saliva. The formation of nitric acid, possessing all the activtiy of the new birth, is the production of an agent which is able to eat up everything there is about a tooth, enamel, dentine or cementum. It has a stronger affinity for the lime salts than for anything else. It dissolves the sub-phosphate of lime without decomposing it. Acting with less force upon the enamel matter of the tooth it leaves a portion of that enamel matter to do what?—to undergo decomposition by the action of oxygen. The repetition of this process in the cavity of the tooth explains the pene-

trating power, and I think there is nothing eaten in any other way.

We have another phenomenon resulting from this ammonia. For example we will have, in such subjects, a spongy condition of the gums, and a flaccid condition of the mucous membrane of the mouth, and we will usually have a very rapid deposit of not very firmly crystalized tartar. It will accumulate in great quantities, producing a diseased condition of the mouth in general, but especially a granular condition of the membrane attaching the teeth to the socket. How does the ammonia do this? In this way; the carbonic acid which is held in the solution helps to keep the carbonate of lime in solution. The lime is held in solution by the excess of the free carbonic acid, which is dissolved in the water. Now, by heating the water free carbonic acid is expelled with a moderate heat, and then the carbonate of lime is precipitated. Examine tartar formed under these circumstances; you will find it richer in animal matter, richer in foreign matter than the ordinary tartar, and it will be richer in proportion in the carbonate of lime than in the sub-phosphate of lime. I never saw a specimen that did not contain both salts.

I might go on and consider the other acids, but one type is an explanation of the whole four.

Dr. MORGAN: In his remarks, Dr. Taft set forth the fact that wherever there was arrested development, it left its mark, as a rule at least, upon the enamel, so distinctly that it could be read, and intimated that it might have left its impression throughout the entire system. I have been profoundly impressed with the idea for some years past, and my reason for calling attention to it now is because of its great practical value in the practice of dentistry. Whatever condition there may be in the deciduous teeth that interferes with nutrition to any considerable extent, leaves its permanent impress, not only upon the permanent teeth but upon the entire tissues of the body. They are never entirely repaired, and if they are defective, life is shortened because of that defect. My reason for calling attention to this now is that I may suggest to the profession the importance of the utmost care of the deciduous teeth. If they become so diseased at any time as to interfere with mastication to a sufficient extent to arrest assimilation or nutrition, a permanent injury is done to the system and life is thereby shortened.

Dr. JUDD: As far as I heard the remarks of Prof. Taft I am led to believe that he put forth some doctrines that we have been accustomed for the last fifteən or twenty years to hear, and undoubtedly defended them with as much ability as any one could well do it; but I was more particularly interested in this question from the confession that we needed something more than we had twenty or fifteen years ago, in order to explain the phenomenon which we witness in this carious action. I never felt satisfied entirely wtih the theories that had been put forth at that time. I do not wish to say that I have been entirely satisfied at the present time with any of the theories that have been put forth; but I was always in hopes that we would have something that would lead us to a theory that will be more acceptable, more probably true than the theory which is put forth by Tomes, for instance, or by Harris.

With regard to the vital theory I would state one fact. Take a tooth that has been extracted, and take off the crown and reinsert it in the mouth upon an artificial plate or upon a pivot and we find carious cavities developed in these crowns of teeth, essentially the same in all particulars as those that are developed in the living teeth. I am not going to deny but what the vital force that we have talked a great deal about, and which we know but very little about exerts some influence; but the fact is sufficient for our present purpose to know that caries takes place in dead teeth, essentially in every particular as it takes place in the living teeth.

I have no doubt but what the experiments of Dr. Watt in this direction were valuable. I have no doubt but the acids of the mouth have a very great influence in engendering decay. I do not wish to throw any discredit upon his experiments at all, but what I wish is more. You take a tooth out of the head and place it in an acid fluid 98° Far. I want to ask any gentleman if he has seen carious cavities produced there with the peculiarities of the carious cavities that we constantly see in the teeth. I have tried it several times and have found that it produces a general effect over the surface of the teeth. I do not find any hollowing out and a penetration down to the pulp cavity. I am not satisfied to lie down and close my eyes satisfied with the theories of our fathers, and attempt to find out nothing more about it. I am

satisfied that we have discovered one agent that has some influence here, the parasite. There are very few microscopic observers in this country that are capable of examining this question and determining whether there were spores or *leptothrix buccalis* there or not. The examination may have been with an inferior instrument, or may have been been made by men who were not acquainted with the appearance of the parasite. We have the evidence of the best microscopists in the world—men of world-wide reputation, who have declared that almost invariably where caries does take place, of the penetrating kind, a proper examination reveals the existence of these parasites and parasitic germs.

It may be asked how do these act. I cannot tell you how. It has been stated by some observer that when the germ is developed, and the germ is found within the dental tubuli, there is a distention of tubuli. It may be there is a simple distention of the tubuli, allowing the acids of the mouth to reach one part of the dentine much more easily than it does any other part, or it may be that they exercise an immediate influence themselves upon the soft tissues, for in dead or living teeth I want you to understand that there is almost exactly the same amount of soft tissues in the teeth. Again it has been surmised by some that it is through the influence of these parasites that the acidity of the fluids immediately surrounding them is increased. This I think is a very probable theory.

REPORT OF THE COMMITTEE

ON

DENTAL CHEMISTRY.

By H. A. SMITH, Chairman.

THE past year has not, so far as your committee are informed, been prolific in research or original investigation in the department of dental chemistry.

It would indeed at first glance, seem that but little had been accomplished, or definitely settled in this branch of dental science. But when we reflect that original research in a science like chemistry requires a severe and special training, coupled with a fondness for the pursuit, and the command of considerable time and means for experimentation, and when we consider also that dental science, is as yet a new born science, we can but congratulate ourselves, that so many practical applications in dentistry have been made, which are based upon, and the direct result of discoveries by men in the profession, of the scientific facts and principles upon which they rest.

It is true in our own as it is true of all departments of science and art, that principles and discoveries have from time to time been announced, which have seemed chimerical and of little or no practical value. No hasty judgment however should be passed upon these discoveries, for some of them at least, have been made in the true spirit of scientific inquiry, and may yet lead to results of great importance to mankind.

It is a singular fact too, which holds true of dentistry, that these practical applications are usually made by others than the original investigators. A striking instance of this occured in the

discovery of chloroform by Liebig, in 1834, but it remained long after for Simpson to apply it to the relief of human suffering.

And so of nitrous oxide, the anæsthetic properties of which were first discovered by Sir Humphrey Davy. But no application of the discovery was made until one of our own profession, Dr. Horace Wells, many years after, made the first practical demonstration of anæsthesia by this agent on his own person, by having a molar tooth extracted, and at the same time proving to the world the feasibility of anæsthesia.

To Prof. Judd we are indebted (since our last meeting) for the translation from the French of a paper by Dr. Vergene, entitled, "Of Dental Tartar and its Concretions."

This thesis is valuable to the dental student, not only for the original analysis of dental tartar which the author has recorded, but also for the examination of each of the salivary fluids, and the grouping together of the several views of physiologists and chemists as to the character of these fluids, and the changes which they undergo in the mouth induced by certain forms of disease.

It will be remembered that at a former meeting of this Association Dr. Chase offered a paper upon the saliva, in which he stated that "the *chemical reaction* of fresh saliva is found to be in the human species nearly always acid or neutral." Dr. Vergene, after giving the observations of a number of experimenters, says: "In view of these facts we are enabled to state that normal saliva is alkaline, since alkalinity exists while the gland is performing its function. If the saliva is acid it has begun to undergo a change. During repose of the salivary glands the mucous coverings of the mucous membranes, and the *debris* of the alimentary substances, enter into the formation and form acid products, such as lactic acid, butyric acid, and others, according to the aliments which are soluble in the saliva, and they give it acidity. It is easy to understand how this acid saliva, before being neutralized by the alkaline saliva at the moment of its flow, might form, by its mixture of the two fluids, a third saliva which would be neutral." As to its alkalinity or its acidity, according to the researches of Robin, "no affection can render it acid while it is flowing from the gland. The acid reaction is due to changed buccal mucus."

Dr. Vergene defines tartar, usually, as a yellowish-white deposit forming upon the teeth and adhering strongly to them. It is of a phosphatic calcareous nature, concrete, unctuous upon its free surface, and it may acquire a great density. The color of tartar is variable. It is sometimes a green color, attributed to chlorophylin, which it retains in its substance. At other times it is a more or less deep brown, particularly upon the internal surface of the teeth. That this tint resembles tobacco or soot is not surprising in smokers, and in those people who have more or less scorbutic gums; but as it is met with without these etiological conditions, we must suppose that this coloring matter is not furnished by the carbon of the blood alone. It is probable that its origin is found in the sediment of the saliva or in the food. In certain subjects tartar has a slate or blueish or blackish color. This is usually given to it by the sulphuret of lead, sometimes of copper, and even of iron. In children the deposited tartar is, in some cases, yellow from saffron. Tartar shows under the microscope, when dried, cavities of a polyhedric form. These cavities, in tartar taken fresh from the subject, are filled with mucus mixed with *debris* of aliments, or they are alive with vibrios.

Acetic acid attacks tartar slowly, by displacing the carbonic acid of the carbonate of lime. Citric acid softens it; hydrochloric dissolves it; while a solution of potassa renders it more friable.

ANALYSIS.

Dr. Vergene made two distinct analyses of tartar taken from the incisor and molar teeth. The following is the result obtained by the second analysis:

	Incisor.	Molar.
Loss (organic material, water and alkaline salts,)	24.69	24.40
Phosphate of lime	63.88	55.11
Carbonate of lime	8.45	7.36
Silica	0.21	0.37
Phosphate of iron	2.72	12.72

In both analyses it was shown that the phosphate of lime is found in much greater quantity in the incisor tartar, while the phosphate of iron dominates in the molar. These results are opposed to those obtained by some other experimenters.

The phosphate of iron, as well as silicon, are always present in tartar. The large proportion of silicon found in the tartar on the molars is explained by the presence of silica in the parotid saliva.

This author, after giving the different theories upon the formation of tartar, concludes as follows: "Tartar results from a change in the saliva and of the gingivo-dental deposit, of which the latter is decomposed or hastens the salivary fermentation. The deposit of tartar is formed uniformly upon each tooth, but there are two points in the mouth where this deposit may be pronounced sufficiently to constitute concretions of tartar more or less voluminous. The seats chosen for these concretions should be attributed to mechanical causes. The composition of tartar varies with the subjects. There is always a difference of composition between the tartar of the molars and that of the incisors.

During the past year Dr. G. V. Black, of Illinois, has been conducting a series of observations and experiments to ascertain the causes which produce the various colors observed in carious teeth. The results of these researches have not yet been given to the profession, and, upon request, he has kindly furnished your committee a statement of his labors and deductions in this direction. We invite your attention to a summary of his paper:

Dr. Black first calls attention to the fact now generally admitted, that decomposing animal matter is darkened in color during the progress of decomposition. This is effected by the formation of sulphuretted hydrogen, which then precipitates any metals that may be in the solution in the form of sulphurets. Some of these are black and insoluble in the menstruum of the decomposing mass; whence arises the change of colors.

Now, when we come to examine the elements and combinations found in the mouth, it is easy to conceive that the insoluble sulphurets may be found there also, and that they have to do with the color of the decay of the teeth is highly probable. For example: in those cases in which the death and decomposition of the pulp occurs, without apparently any external opening to the pulp chamber, we have the same tendency to the formation of insoluble sulphurets that we find in decaying flesh elsewhere; and it is but natural that these sulphurets should tend to block

up the dentinal tubuli, giving rise to the darkened color which we observe. In time, after repeated infiltrations of coloring matter, the tooth may be rendered almost black. In the ordinary cases of decay, we do not have, seemingly, exactly the same tendency to the deposit of sulphurets. But when we remember that in the mouths of most persons there is formed at frequent intervals sulphuretted hydrogen—often in large quantities—and also that there is introduced with the food and drink an abundance of the metalic elements, especially in animal food, which is so prone to a lodgment between the teeth, there to undergo rapid decomposition with sulphuretted iron as an ultimate product, which, in turn, may give color to the caries of the teeth. The presence of iron in the mouth may be due also to the fact that the blood, and every secretion formed from it, contains traces of iron. It is present, as well, in the soft tissues of the mouth, and it has been stated to be a constituent of the teeth themselves.

Reasoning upon this state of facts, Dr. Black was led to make some experiments, which he describes:

Teeth were subjected to action of hydrochloric acid of such strength that the lime salts were not removed entirely from the teeth. The solution being transparent, and the remains of the teeth white, sulphuretted hydrogen gas was passed through a tube into the liquid. This had the effect to change the liquid to a yellowish color. The color of the teeth, after a little time, was changed to that of the liquid, and to a depth corresponding to the action of the acid upon them. The color corresponded very nearly to the light yellow color observed in carious teeth. In another similar experiment, the solution of acid was slowly neutralized by soda, while the sulphuretted hydrogen was being passed through. The color gradually grew dark, until the solution gave a decidedly alkaline reaction, when the precipitate was decidedly black. When ammonia was substituted for the soda, the color produced was blue-black. By varying the intensity of the acidity and alkalinity, he was able to produce all the colors of decay in teeth observed in the mouth. It was also noticed that if a solution of a tooth was rendered alkaline by soda or ammonia, without the presence of sulphuretted hydrogen, a perfectly white precipitate was thrown down. This fact may serve to explain

the formation of the so-called chalky spots upon teeth occasionally met with.

The reagents used in these investigations were not tested for iron or lead. But since the object of the experiments was not to test for the presence of the metal in the tooth itself, but rather to ascertain if parts of a tooth acted upon by an acid would give lodgment to, and partake of the color of, these sulphurets, it is probable the reagents employed were not sufficiently impure to affect the result.

It was observed that the shades of color produced in acid solutions were lighter than those produced in the alkaline. The length of time in which the deposit was being formed also modified the color: a slow formation producing the darker varieties, and the more rapid the lighter colors.

It does not follow, as may be supposed because these colors are produced by sulphurets, that all decays would be black. Take for example, a crown cavity in a molar, in which the degree of acidity is marked and the decay progressing rapidly; the coloring matter would be washed away as fast as formed with the softened mass, excepting at the margins of the cavity, where the action on the tooth bone is slower. In those cases of decay denominated stationary, we find them very generally black. The parts dissolved by the agent of solution are washed away, and those parts but partially acted upon, are blocked up and filled with the coloring matter.

It should be stated that peculiar varieties of color may arise from the lodgment of coloring matters, of either vegetable or mineral extraction, which may form in the mouth; but these must be regarded as exceptional, as all the common gradations in color may be formed by the lodgment of sulphurets.

Dr. Black, in studying the action of dilute acids upon the teeth, was led to suppose that vibration or rapid motion might modify their action. Accordingly, an apparatus was devised by which he was enabled to keep the solution in constant motion at the rate of one hundred feet per minute. The strength of the solution used was one part of hydrochloric acid to four hundred of water. In this was placed two perfectly sound bicuspid teeth with their approximal sides together, and adjusted in the relation to the current so that it would strike against their buccal

surfaces, but obliquely, so that the current would be changed from its course before it passed between the teeth. The teeth were subjected to this action for six days, and the result carefully noted each day. After twenty-four hours the points of their cusps were cut away almost exactly as in abrasion, and a slight groove was observed between the teeth just below the point of contact. The surfaces of both teeth were left smooth and hard.

On the third day the cusps were gone, and the groove between the teeth had extended into the dentine. The enamel was being cut away from the side from the current. On the fourth day a hard spine was noticed, which evidently contained the slender buccal horn of the pulp. The opposite horn of the pulp was exposed. This appearance would remind one of the phenomena referred to as the effect of vitality to prevent exposure of the pulp. A little later this hard spine had disappeared, and the pulp was exposed at the point where it stood.

Fifth day: The cutting continued from the crown and groove between the teeth. The enamel from the palatine surface is wasted to about one-third its thickness, and a close examination of the buccal surface showed that it had very slightly diminished. The edge of the enamel all around the buccal surface is elevated, coming to a sharp edge above the dentine, which is cupped out; but around the palatine surface it is rounded off, and does not rise above the dentine.

Sixth day: The acid was at work in the pulp chamber, and the crowns were going to pieces generally, when the experiment was discontinued.

It should be noted that the cut surfaces during the entire experiment were left smooth and hard, as in abraded surfaces. When the acid entered the pulp chamber the same softening manifested itself that we find in the ordinary experiments with the acid solution in the quiet state.

During this experiment a tooth was kept in another portion of the same mixture, but without motion. This showed nothing more than the usual slight softening. A number of similar experiments were tried, and in every instance the cutting was least upon the surface placed fairly against the current, and most where it broke around the tooth. The softened condition was only shown where the current was nearly or quite suspended.

The action of acids usually supposed to be in the mouth is that of simple solution of the phosphate of lime, which still maintains its distinct character as a phosphate, as salt dissolved in water retains its character as salt. It is not a chemical action in the same sense as that of a solution of a metal, which is resolved into a chloride, nitrate, etc. The reason why a tooth may be disintegrated by a weak solution of an acid at certain points, while other points are not affected, is not easily explained with our present knowledge. An understanding of this subject requires a better knowledge of that peculiar force which may be termed *surface attraction*, or surface condensation, by which a gaseous or liquid substance is attracted and adheres to the surface of a solid.

Almost all liquids are more or less strongly attracted to solid surfaces. As an example: if a glass rod is plunged into water, it will be found on removal that a film of water adheres to it. The water is attracted to the glass with greater force than its molecules to each other. It may be shown that it is possible for one liquid to be attracted to a certain solid with greater force than another, by passing a rod of iron, which has been previously wet, into an emulsion of oil and water, and, withdrawing it, we find only oil on the surface. The water has been displaced by the oil. These differences in surface attractions are not so readily demonstrated with the miscible liquids, but there is but little doubt that it exists. If we dip a tooth in either water or acid it brings away a film; but the film of acid is more difficult to wipe away than the water. The attraction is stronger, and consequently it adheres more closely. If a tooth is dipped in a solution of acid and water it will, of course, bring away a film of both; but whether either exists in greater proportions as compared with the solution, is not readily determined. Experiments indicate, but do not prove, that the acid suspended in the liquid is gathered to the tooth in greater proportion than the water.

It was this line of experiment that led Dr. Black to make those already mentioned, with acids in motion, under the supposition that if a condensation of acid took place, the motion of the fluid would tend to prevent it upon those portions of the tooth washed by the current, while it would be manifested by its action upon those portions not so washed. And notwithstanding this

peculiar cutting from the cusps or sharp angles of the tooth, which may be regarded as simply a physical modification, our experimenter is convinced that it is highly probable that this will prove to be the true explanation of decay, and at no distant day caries of the teeth will be artificially produced, and its *modus operandi* explained.

There is great need of an intelligible explanation of some of the phenomena presented in this disease, if we accept the acid theory of decay. As an example: the exemption of the anterior teeth in the lower maxilla from caries, which we so often observe in cases where the other teeth are more or less attacked; also, that a tooth should be carious upon a surface where there is seemingly no physical defect, and not upon another surface equally exposed to the action of the corrosive agents, are stumbling blocks in the way of accepting this hypothesis as the cause of dental caries.

Dr. Black, it would seem, has a clear apprehension of the difficulties which surround this subject, and has earnestly set about to discover, if possible, an explanation of that which is obscure in the causes which induce dental caries.

It is to be hoped that he will continue his experiments and researches in the direction already begun, as we feel confident they will command the careful attention of the earnest student of dental histology and chemistry.

The action of the coloring matter in red vulcanite—now so largely used as a base for artificial teeth—upon the parts of the mouth with which it comes in contact, and also its effects upon the general health of individuals wearing it, is a subject that has, from time, to time attracted the attention of, and been discussed by, the dental profession. Though regarded as a pathological question, it is, perhaps no less a chemical one, and may properly be considered in this connection.

A reference to the published statements and opinions of the profession regarding its use would indicate that there are two views held, directly opposed to each other.

The few who do not use red vulcanite in their practice, regard it as highly injurious, and claim that they see a diseased condition in nearly every case where it is worn. On the other hand, the larger number claim that it is an inert substance, and that evi-

dence is wanting to show that it has any deleterious effects, except, perhaps, in rare cases of a peculiar idiosyncracy.

Vermilion, as you know, is the pigment mostly employed to give color to the red vulcanite. The amount introduced to accomplish the object would give a proportion of nearly 36 per cent. of mercury as compared to the whole mass. Vermilion is a compound of six parts by weight of mercury and one of sulphur, in the form of a sulphide, which is insoluble in the mineral acids and caustic alkaline solutions. Nitro-hydrochloric acid, however, will decompose it.

There is one fact in connection with the manufacture that is worthy of note. In spite of all precautions, it sometimes happens that the mercury "flours," and, as it seems, every minute globule, is coated with a thin layer of sulphide. This condition, together with the well known action of light upon vermilion, to turn it dark by decomposition, the tendency to which is increased by the presence of impurities, may explain the presence of free mercury in the mouth; the little globule being liberated by friction on the plate whilst in use, and the action of light freeing the metal by decomposition.

The quantity of mercury which may be freed in this manner would hardly be sufficient if taken in a compact mass, to produce the usual physiological effects of mercury.

But instead, we have it introduced into the stomach in a finely divided state, which greatly facilitates the production of chlorides to which the active effects of the metal are due; these chlorides being formed by the chlorides and free hydrochloric acid of the stomach.

Some of the cheaper varieties of vermilion are adulterated with red lead, penta-sulphide of arsenic and other impurities, and to these agents, no doubt, may be traced some of the poisonous effects observed.

In studying the physical properties of vermilion, some five or six varieties of American, English and Chinese manufacture were subjected to microscopic examination with a magnifying power of 80 diameters. No essential difference was observed in them, excepting in the relative size of the crystal, which in the American variety was much the largest. In all the specimens examined there was observed numerous grayish white

globules, resembling free mercury. It is probable however that this appearance is due to an amorphous modification of the crystaline form. These were most numerous in the American manufacture and a variety called "Triste".

In our investigations of the causes which induce the symptoms of salivation, which it is claimed are so often observed by persons who wear vulcanite, it should always be made a matter of inquiry, if the patient has not within a recent period been under mercurial treatment. For it is well known that even severe salivation does not of necessity prove that mercury has been recently administered. It has been shown by Melseur's researches that mercury may for a long time stay in the system forming insoluble compounds, it is supposed, with some of the organic products of the body, and then suddenly manifest itself after the administration of the iodide of potassium for example, which loosens it so to speak, from its compound; and if the quantity is sufficient, all the effects of ptyalism are produced. Piggot relates a case in which a patient was violently salivated five months after taking mercury, by the use of iodide of potassium.

The difference of opinion and uncertainty as to the propriety of using red rubber for dental purposes, which exists among the dental profession, reflects little credit upon a body of men whose practice they claim is based on scientific principles. If this compound affects injuriously the health of our patients in any degree, it is clearly the duty of the profession to at once abandon its use. And if our Association should institute an investigation of this subject, whereby the doubt which surrounds it would be cleared away, it would relieve the apprehensions of many conscientious practitioners, and also confer a benefit upon the public.

In concluding this report your committee can but express the hope that ere long dental chemistry will receive that attention which it demands as one of the branches of a thorough dental education.

There is much that is obscure and uncertain in the etiology of those diseases which the dentist is most frequently called upon to treat, that it is highly probable can only be made intelligible by chemical investigation aided by the microscope. Before we can hope for much in this direction however, a taste for the study of this subject must be cultivated in our dental students, and this

can only be done by making the study of chemistry as attractive as possible in our dental colleges, by teaching in the laboratory largely, with experiments and practical demonstrations. The professors should have at their command ample resources, so that their laboratories may be supplied with the needed apparatus for illustrating both analyitcal and synthetical chemistry, as well as for the study of physics.

Teaching in this department should not be made secondary to any other pursuits; on the contrary, the teacher should be able to live by it, so that his best energies may be given to his duties as an instructor.

This means practically fewer dental colleges, and a higher standard of dental education.

In Memoriam.

WHEREAS, This Association has with sorrow learned of the death of Professor THOMAS B. HITCHCOCK, of the Harvard Dental School, one of our most valued members, and the Chairman for this year of the Committee on Histology and Microscopy; therefore,

Resolved, That we signify in this public manner our sense of the great loss which the profession and the cause of dental education has sustained; and that this resolution be inserted in the records in the place where the Report of the Committee would have appeared.

E. A. BOGUE,
J. TAFT,
L. D. SHEPARD, } *Committee.*

REPORT OF THE COMMITTEE

ON

OPERATIVE DENTISTRY.

By L. D. SHEPARD, Chairman.

YOUR committee will not be able to make a complete report upon all the questions of interest in this most important department of our specialty, and will not attempt to go over so much ground as some of your committees have in past years; nor will they enter at length upon details of practice which seem to them more appropriate to local societies than to a national body; but they will confine themselves mainly to the review, at some length, of a few topics which seem to them of great importance at the present time.

Considerable progress has been made during the two years since a report has been made to this Association, not so much in the bringing out of new methods and appliances as in the testing of the old, and in improvements in their construction and application, and in assigning to new processes their proper place and value. Most startling and suggestive of future changes is the rapid stride made by machinery for facilitating dental operations, within the past two years; the machines then in use have been improved and new ones presented. Their rapid sale shows that their introduction has met a universal want. While they have been used quite largely without judgment, and by the less skillful men, with lamentable loss of valuable tooth tissue and pulp integrity, they must be regarded as indispensable adjuncts to the hand instrument. We are doubtless but upon the thres-

hold of dental machinery, and shall soon see machines for purposes which have not yet been thought of.

The new engine just brought out by S. S. White commends itself to me as the best which I have seen, and yet this and all others lack, I think, two requisites for complete success. One is power independent of the operator. I consider the foot treadle in its most perfect form, as in the above named engine, as a great objection. When cutting live tissue at such approximation to the vital center as is often the case in excavating, no nervous force should be withdrawn from the object upon which we are operating, to be spent upon giving the power to drive the machine. Practice will make this deviation of nervous force so little appreciated as to appear almost automatic, and yet the truth remains that there is just so much force expended upon this part as is necessary to drive the machine, which could be estimated in figures, and in fact amounts to considerable in a day's work. Electricity has been tried, and has secured the endorsement of some men of good judgment, but cannot yet be regarded as a success, in giving power as well as speed. Steam has many objections, but they may be partially surmounted. I have seen an engine which may be driven by steam at five pounds pressure. This could be used in any building which is heated by steam. While this would be perfectly safe, still the very idea of steam as being a dangerous element will tend to prevent its general use for this purpose. Several water motors have been invented. One, the Backus water motor, which is a small undershot wheel in an iron case has been found very useful in driving sewing machines. It has also been applied as a power for driving dental engines. A photograph of a Morrison engine with this wheel in the place of the usual driving wheel has been sent to me by Dr. Brown, of New Jersey, which I shall be happy to exhibit.

Dr. Fisk, of Massachusetts, has combined several of his ejectors and so got sufficient exhaustion of air to drive a burr with the requisite speed and force. In both of these water motors ten to twenty pounds pressure of water is demanded, and the use of the water is more than one gallon per minute. Experiments are making, and I trust will be successful, to produce a water engine

which shall be free from the peculiarities which have so far made such motors objectionable for dental use.

I have been much pleased with a motor called "The Universal Spring Motor," which gives even more power than either of the foregoing at no expense. The springs are wound up with ease in one half minute and will drive a large sewing machine twenty minutes. The appliance is contained in a box, less than a foot square, and can be used anywhere, an advantage over water or steam. I have confidence that in some such combination as this last when improved and prefected will be found our most generally adaptable motor.

The other requisite is a method of suddenly starting and stopping the burr, without withdrawing it from the mouth, independent of the power. There are times when we can, with safety, make but a few turns of the instrument and then must examine, or need to get the instrument into exact position before it is revolved. By means of a chuck or similar contrivance in the handpiece regulated by the thumb or finger this great end would be secured.

The tendency a few years ago was to the use of heavier mallets, or greater impacting force in welding gold. Though the heroic use of such instruments may be still continued by some of our best operators, there has been more recently a gradually increasing tendency in the other direction, which has been carried by some to the extent of simply rubbing down the added pieces of foil, by the slightest possible pressure.

Ivory points were introduced by Dr. Shumway, of Massachusetts, who claimed that with these instruments he obtained a perfect welding of the gold with very slight pressure, the less the better, and that the ivory points did not burnish the gold, thus interfering with easy welding, as did a steel instrument. My own experiments with this method have not been satisfactory, and from what I have seen of the clinics and results of the inventor himself I cannot recommend the method as one calculated to secure the best results. Dr. Fillebrown, of Maine has urged upon the profession a set of steel instruments with very hard points which he uses with light pressure, and a slight rotating motion with no rubbing. I have not acquired the skill to use these instruments in his way to my satisfaction, but the work

done by the inventor will bear critical examination, and has proved a success in cases that I have examined after two years of wear. I believe it is not claimed that there is any saving of time by this method, but that it is much more agreeable to the patient, with less danger of injuring delicate or frail enamel walls and edges.

A very novel and ingenious plugger has been invented by Dr. Dennett, of Massachusetts. It consists of a small serrated wheel fixed upon the end of a plugger, so as to revolve when passed over the gold. This instrument is not to be used in the commencement of the filling, but after some progress has been made, and in large or protracted operations; more pressure being needed than in some of the above instruments, and yet not much. The annealed gold ribbon or rope is put upon the gold and by successive rolling and folding welded to what has gone before. I can recommend these instruments and have found them most agreeable to the tired patient, and the tooth sore from protracted pressure or malleting. The result as shown by the after filing is a very solid and perfectly welded mass.

A very complete saliva ejector has been invented by Dr. J. E. Fisk, of Massachusetts, use being made of the old principle of the Gifford injector, which by a small current of water secures sufficient exhaustion to completely withdraw from the mouth the accumulations of saliva. This instrument is perfectly clean and noiseless and is to be used with or without the rubber dam. I would recommend this little appliance to any one who has water in his office.

I have experimented somewhat with a new preparation of platina foil which is now furnished in such shape that it can be used with nearly the same facility as gold, the welding being secured by coating the platina foil with gold on each surface. For restoring the contour in anterior teeth, the gray or tin color is more agreeable to the eye, and, other things being equal, this should commend it to us and to our refined patients.

A general increase of interest in the discussion of the comparative merits of cohesive and non-cohesive foils, has recently arisen as a result of an article by Mr. Fletcher, of England, arguing that it is impossible to make water-tight fillings with cohesive gold. Whatever may have been the results of the use of cohe-

sive foil in England, there can be no question that experiments in this country, after the manner of Mr. Fletcher, have proved that perfectly water-tight fillings can be made with cohesive foil. And further, I have no doubt but that this is true of the great mass of fillings introduced in the mouth, by the great majority of skillful American practitioners. It is equally true that multitudes of fillings are made which are not water-tight. Such always has been and always will be the result with any material. In discussing what can be done we must eliminate want of care and skill.

A discussion upon this limited view of the question will be of comparatively little utilily, and I do not propose to waste time upon it. But the question of Mr. Fletcher has done good, and when stated more broadly as an inquiry whether the profession in America has not the past five or ten years used too much cohesive and too little non-cohesive gold for the accomplishment of the great end in view, the saving of the largest number of teeth for the largest number of persons—when so stated, I think, it presents a question of deep interest to us as a profession, and of vital importance to the public as sufferers.

The conclusions of Mr. Fletcher have seemed startling to many, and under his leadership we have heard utterances which to the cohesive enthusiast have seemed rank heresy, from men who have been popularly regarded as in the foremost ranks of progressive operators. It would seem as though they had suddenly changed front and by a leap gone back twenty years. Were it true that such sudden conversions were common, we should have little respect for a profession whose theories and practices were built upon so insecure a foundation. The student of history recognizes no fact as more universal than that revolutions are not of mushroom growth, but are the outbreak of long pent up and slumbering forces that when once under full headway sweep away not only the abuses of the past but many a monument of heroism and virtue. Such I think has been the history of the introduction and almost universal adoption of cohesive gold and the mallet. The day is not long past when to advocate non-cohesive foil and hand pressure was to sign one's warrant of consignment to the realm of old fogyism. That a reaction was sure to come, no one familiar with the laws of change could for a moment doubt. That it should come without a sudden out-

break, but gradually, was much to be desired. It has not been generally known, till recently, that many, very many of our best, most active and progressive men have been for the past three to five years, working out this reaction in the quiet of their offices, as is shown by the fact that the gold foil manufacturers have been selling more and more of non-cohesive or so called "soft" foil, and less of cohesive (I do not use the term "soft" foil, as it is a vague term as generally understood.) These men have been thinking, working, watching, and except occasionally in public and in their class instructions have given no expression to their change of views, and were hardly aware of it, so gradual had been the process, till suddenly asked a startling question.

No one will deny I think, that the greatest discoveries or inventions of the century in our art are the rubber dam and cohesive gold. The great revolution in practice which has resulted from them attests their importance. All honor to Robert Arthur who made haste to spread broadcast to the profession his discovery of the cohesiveness of gold and his reasoning therefrom. All honor likewise to Dr. Barnum for doing the same with the rubber dam. Many men in the profession before 1855 knew of the cohesive qualities of gold. I have seen welded fillings which were inserted in Boston over thirty years ago. The gold was annealed in platina pans. The late Dr. Westcott claimed the discovery. But to Robert Arthur and to him alone belongs the credit of the discovery, from his proclamation of it in 1855. I do not know as any attempt has ever been made to take from Dr. Barnum the full credit which belongs to him. I give them all honor and my respectful homage. As a result of their lives the possibilities in saving teeth have been immeasurably enlarged. No man can do first class work without having at his command these two most indispensable adjuncts. Our societies and literature afford ample evidence of how happy the profession is in the possession of these means for accomplishing results which previous to their day were impossible. Almost all the clinics for many years have been devoted to the exhibition and elucidation of how to best use these materials, and secure the most beneficial results. Such clinics have done great good. The profession has been urged to adopt and has pretty generally adopted the maxim that time and cost are of no importance in compari-

son with perfectness and beauty of result. I have sympathized with all my enthusiasm with this progressive movement.

During the past four or five years, however the question has year by year been forcing itself with increasing urgency upon my attention, what is best for the patient—by what method and with what material can his teeth be saved with the least expenditure of suffering on his part and of time or money? This important question implies that the interests of the patient are paramount to those of the profession, and should, I think, underlie our every effort, and accordingly as any method or material answers it, should it stand or fall. Let us seriously ask ourselves whether in our earnest striving after perfection of operations we may not somewhat have lost sight of it, and to a certain extent proceeded as if the patient had no rights which the dentist was bound to respect.

The filling of teeth with gold to-day is a much longer and more tedious operation than it used to be, say on an average twice or thrice as long. It is the common impression with the public that it is also a much more painful process. A part of the increased time and pain is no doubt the result of an appreciation of the necessity of more thoroughpreparation of the cavity, but a part is certainly the result of the different manipulation demanded by the use of cohesive gold. Can we spend an hour to better advantage than in discussing whether all of the added time and pain is absolutely necessary for the saving of the teeth. In introducing this question, I am I know treading upon dangerous ground where I very likely may be misunderstood or misinterpreted. Nothing is further from my mind than to advocate so called "cheap dentistry," and yet in passing let me say, that we shall deserve ere long to lose our position of good physicians unless we devise some way in which good cheap dentistry may be placed within the reach of the masses, or furnish, as a friend of mine put it, "dentistry for the poor, versus poor dentistry." To return to my point, every moment spent upon a filling which is not necessary in the salvation of the tooth and its restoration to usefulness, is mis-spent time, and the using of it a fraud upon the patient. In every unnecessary pang which we inflict, we violate our most sacred mission, and injure directly or indirectly our patient and all who are afflicted. I feel that as a result of the teachings and discussions of the past

ten years the tendency has been to this extreme, and that it is high time that some one should take his reputation in his hand and lift up his voice as a champion for the sufferers. We have well nigh run mad upon the rubber dam, cohesive gold and the mallet. There is no good thing in the world but can be abused, and these have been to a shameful extent, not by all practitioners by any means—some have not adopted them at all—I am sorry for their patients; but it is true, I think, of the majority, especially of those who have entered our ranks within the few years past. These have had no opportunity, or have not cared to learn anything else, as in the artificial department they know no plate-work but rubber. In our striving after the new we have left behind the good as well as the bad of the old. Our conversion has been too sudden and too radical to be valuable.

Our profession may be divided, as can all society, into three classes, without however any sharp dividing lines.

There is the enthusiast in progress who is ever on the alert to discover or learn of something new. This he adopts with eagerness, frequently with little or no investigation, the novelty of it being a sufficient reason. He adopts it in all cases, whether it is applicable or not, and thinks it the greatest improvement of the age, casting aside all of the old which is antagonistic to the new. Among this class are a few who with great faults and authors of much mischief, are the world's greatest benefactors. No reform, no progress can be achieved without their aggressive aid. The public are the gainers by their lives, their own immediate patients the sufferers. I admire them and am willing to follow them, but a great way off.

The other extreme are those who either from indifference to progress or complacent satisfaction with what is, neither investigate nor adopt anything new, but keep on in the old ruts, treading the paths their fathers trod, running no risks, and many of them doing excellent service for their patients, so far as they have the means; safe men, always to be relied on to do the same thing whether good or bad. Everything new is an innovation and hence to be ignored without question. They look down from their serene heights upon the reformers, and wonder how such insane men can get any recognition. These do more general good to their patients, doubtless, than the former class, but are

cyphers so far as advancement is concerned and of little benefit to and influence with the profession. We respect them as we do age, but are willing to leave them far behind.

The third class is between these two extremes and embraces, I think, the great mass of practitioners. These are interested in progress and yet more interested in the good of their patients. They investigate the new, make trial of it with caution and watchfulness, patiently awaiting the result, and do not cast aside the old until their trials have convinced them that the new is better than the old. Their progress is ever upwards step by step. Earnest men but quiet, and not over sanguine, attentive, receptive, forming the great impartial jury, whose verdict will stand the test of time. A great many in this large class do not answer to the above description so far as their personal investigations go, but they belong to it, as they follow close behind their cautious leaders, who are very numerous, and whom from experience they know they can trust.

I would most earnestly recommend to the general practitioner to enroll himself among this middle class, and to adopt as his motto, the well known aphorism:

> "Be not the first by whom the new is tried
> Nor yet the last to lay the old aside,"

The first class which I have sketched have been so aggressive and outspoken in their views that the impression has been conveyed that a man will lose caste if he acknowledges the use of non-cohesive gold to any extent, or expresses the opinion that there are many cases which can be as well filled without as with the rubber dam, or dares to doubt the truth of the maxim that the typal form is best and should be generally retained or artificially restored.

I have had, perhaps, unusual opportunities for observation and comparison of the results of what might be called old and new school practice, and as a result, during several years, have been modifying my practice. I will not take your time to state at length the reasons for my present views, nor to describe just where or when this or that method or material is, in my judgment, best, but will as briefly as possible, make some statements which are, I think, susceptible of proof.

First: That cohesive gold should be used only where from the nature of the case it is necessary to have the strength of welded gold. In all other circumstances I believe the safety of the tooth and the good of the patient are best conserved by the use of non-cohesive gold. I consider it established that non-cohesive foil fillings well introduced have been successful in preserving the teeth. If this is a truth, why abandon the use of it and subject our patients to an increased expenditure of time and pain to make welded fillings, except in the cases mentioned above where cohesive gold should be used in whole or in part. I believe further that non-cohesive foil is susceptible of more perfect adaptation to the walls of the cavity than cohesive foil, although with nice and slow manipulation, a sufficiently perfect adaptation can be secured with the latter.

Second: In regard to the rubber dam, from what I have heard from prominent operators, I judge that they use the dam in nine-tenths, or ninety-nine one-hundredths of their operations. To apply the dam takes some time, and is generally painful, sometimes to an extreme extent. When necessary, I believe heroic application of it, judicious and kind. But when a tooth can be filled without it, its use is injudicious and unkind; and has done a great injury also in keeping patients away, from their fear of it. There are different ways of applying it, and I think I give as little pain as any one by the use of thin rubber, and in particular by split surgeon's silk as a ligature, which insinuates itself, carrying the edge of the rubber before it, between the free margins of the gums and teeth, without compressing the soft parts; and yet I am free to acknowledge that I use it less than I did a few years ago, and I ask for our suffering patients that they may not be put to any unnecessary torture. As a general statement, I should say that the use of the dam is unnecessary and hence cruel in a large majority of medium sized cavities in the grinding surfaces of superior molars and bicuspids; in a great many cavities in the labial surfaces of superior incisors even when extending a considerable distance under the gum, also in proximal cavities in superior incisors when wedges are used, and to a considerable extent in grinding surfaces of inferior molars, in buccal surfaces of superior molars and in other positions to a still less extent. If you look carefully over this

list, you will find that it embraces a large proportion, perhaps a third, of all operations. I do not expect the young dentist, who never practiced anterior to the days of the rubber dam, will know how to do this, without special instruction, any more than I expect him to know how to do all kinds of gold plate work, but I ask him to take measures to learn of those older in practice who do know how, and I ask the older practitioners this simple question —cast aside all cases which are proximal or come near the gum, do you find that the work of ten or twenty years ago has failed to preserve the teeth? Have your stoppings in the grinding surfaces of molars decayed around or dropped out? Review the instruments you had then and consider the time these fillings took you, has our much vaunted progress been all upward? I will not take time to describe how such cavities can be kept perfectly dry, but I assert that they can be, and am willing to demonstrate it. I do not think however, one can succeed to the extent I claim, unless he can use the mirror in the way which I advocated before the Association two years ago.

Third: That the typal form is best and should be retained or restored is no doubt true in theory, but the attempt to carry it out in practice to the extent which has prevailed in some localities under distinguished leadership, has resulted in such numerous failures as to bring discredit upon our art. After a term of obloquy, judicious cutting away of carious teeth to remove thin edges and allow of proper after cleaning, has once more been recognized as the best practice by very many of our most careful observers. These, after fair trial of contour fillings, have given them their proper place as of immense advantage when the circumstances are such that there is an object to be gained in the restoration of contour, other than the mere theoretical one.

Another topic naturally suggests itself in this connection. It has been often said that any tooth which can be filled at all, can be and should be filled with gold. To this statement I take exception most emphatically. I think there are many teeth and some of them comparatively easy ones to fill, which a regard for the best good of the patient, as spoken of before, demands should be filled with other materials than gold. For example: I would recommend tin as more justifiable than gold for most cavities in the grinding surfaces of molars, when the antgonizing tooth

is gone and hence not subjected to attrition in mastication. The same material should be used in many proximal cavities in molars and bicuspids especially when they stand alone and have strong walls. I need not enumerate the gain in the time and pain saved to the patient, and the very low caloric conductivity of tin, its apparent antiseptic or corrective effect upon tooth tissue and so forth. Old practitioners know this is true, but such has been the frenzy for the beautifully polished cohesive filling that this material, second only to gold, has been swept into almost total disuse to the injury of the profession, and the defrauding of our patients.

Gutta percha, or Hill's stopping, under the stigma of the term "temporary filling" has not been given its proper rank as a most valuable filling for cavities in the buccal surfaces of inferior molars, especially the third, and other places, proximal cavities in the incisors of children.

We have here in tin and gutta percha the best weapons with which to lessen the amount, some ton and a half, of amalgam, which is used every year in the United States for fillings. I am not a disbeliever in the judicious use of amalgam, though I believe it sadly over-used, but some are, and I know of no way to arrest its immense consumption except by the advocacy of tin and gutta percha by our prominent operators.

There are many other topics, in regard to which the same course of reasoning would apply, but I have said enough I think, to stimulate discussion on this subject, which I regard as one of the most important for our high standing as a branch of the great healing art, the sanctity of whose mission has been endorsed by the Great Teacher's favorite assumption of the name of "Good Physician."

DISCUSSIONS.

Dr. Southworth: Those parties who have been in the habit of using amalgams where they can be inserted rapidly will find great difficulty in using the amalgam pellets from the fact that they are so extremly dry. We all have patients who cannot or will not pay for gold and a great many think it is not fair that we should turn them off on hard amalgam.

Having experimented during the last six months I can give the component parts of an amalgam that contains much less mercury than the ordinary amalgams. I took nine grains of amalgam composed of 100 parts of silver and 110 parts of tin, incorperated it with ten grains of mercury, to make a filling large enough for an ordinary sized cavity, washed it and removed the excess of mercury in the ordinary manner, as dry as I possibly could, and in almost every case I found that I had 7½ grains of mercury as the result. I take my laboratory vice and press it out, and I prove conclusively by preparing my amalgam in that way, I have a proportion of six out of sixteen, or two fifths. Dr. Shepard said that the general run of amalgam was one-half.

In cases where the rubber dam cannot be applied without using wedges or filing, I found by taking a little toilet soap and moistening the edges of the cavities on both sides it will slip in between the two teeth.

Dr. Crouse: The last time I heard a discussion on the subject of operative dentistry, was at Niagara. A very prominent college professor advocated a doctrine I did not like. It was the doctrine of filling molars with amalgam. As I have no amalgam to sell, and do not think very much of it, I am not going to discuss it, but I shall pass to the next topic of his report, machinery. He accuses bungling operators who are using engines of various kinds, of cutting away too much of the tooth. It is not a general thing that too much of the tooth is cut away. In my opinion it has been the failure for a great many years, that not enough of the tooth substance was cut away—the fissures are not cut out and

filled up to the end. That has been my observation ever since we have had machinery to do it with. He claims also that the electric machine is not a success. I have no electric machines to sell, but I shall stand up for them, having used one in the neighborhood of three years, as being far better than anything now in use, in my opinion.

I agree with the paper to a certain extent, at least in the use of soft foil. I never have liked the idea of adopting, universally, a heavy foil. I meant to have the author of the report define what he meant by soft foil. If he means entirely non-cohesive gold I do not agree with him at all. If he means soft foil that is partially cohesive, I agree with him as being much better than such very cohesive foil, for ordinary cases. If you do contour filling you have to use a heavy gold, and I know of no other gold so good as No. 60, 120 or 20, for that purpose.

I shall not differ from the author in the opinion that hand-pressure should be used more than it is; especially in chalky teeth, easily crumbled.

We now come to the rubber dam, and the class of teeth to be filled with gold. The author advocates tin foil in the crowns of molars where there is no antagonist. If there is no antagonist one should be supplied, so that there would be a full masticating surface; and I would not fill it with tin. If I prepare my cavity properly why not fill it with gold? It takes but very little longer, if any, a very little more work, and a very little more expense.

I also agree with the paper, that it would be a good thing when we can fill teeth rapidly and well, so as to bring dentistry within the reach of the masses, so that the poor can have cheap first-class dentistry. They don't have much now.

I claim that if the rubber dam is put on by a skillful operator, very little pain is caused, and it is pleasanter than the napkin. It is inserted with little loss of time, and after it is inserted you can see that your cavity is prepared properly, and that everything is right, working with that confidence that you cannot without it.

Dr. MORGAN: I rise to protest against the manner in which gentlemen use the terms soft and hard foil. The softest foil that is made is the most cohesive, and when men say soft foil and mean non-cohesive foil, they do not have the correct idea.

Dr. WETHERBEE: I agree with many things which the Chairman of the Committee has stated. There is incompleteness in the paper, however, as no mention was made with reference to the manner of filling the roots of teeth; what material is best to be used; and no mention was made with reference to the best manner of removing salivary calculus, the style of instrument to be used, etc. It seems to me that the report should have gone further; yet it may be said that time is wanting to cover the entire ground. The more difficult operations on which we should receive instructions should not be ignored, but should be well and faithfully dwelt upon. It may not now be in order to make any extended remarks upon these two points; I shall, however, utter my caveat against the declaration that labial cavities, and buccal cavities which extend under the gum to any extent, can be equally well filled without the dam as with.

Dr. SHEPARD: I did not say buccal cavities under the gum; I said labial cavities even when they extend some distance under the gum. I wish to make that distinction, which is very important.

Dr. WETHERBEE: It is a distinction without any material difference. It is very likely that the operator, if he exercises the best possible care, will bleed the gum. In very hard, firm gums that may not be the case, but in soft gums they are likely to be touched.

Is it true that a patient is incommoded by the application of thin rubber with a very thin twine, No. 58 or 60? I believe the majority of patients would much rather have a clean piece of rubber in contact with the lip than a napkin of proper thickness to prevent moisture from flowing down upon the gum and wetting the filling. After the cavity is prepared to a certain extent a small instrument representing the third of a circle of an eighth of an inch, after the dam shall have been applied, is placed under the gum, lying upon the dentine, below the periphery of the cavity. A slight sensation of course is experienced when this instrument is so placed, but of no particular consequence. Instead of attempting to draw the twine so tightly as to cut the gum, or press severely upon it, the twine is carried up over the instrument, which is held by an assistant, and drawn down very carefully, impinging, not very severely, upon the gum between

the teeth. The saliva is now completely excluded from the cavity. You can now proceed to finish the excavation of the cavity. Having completed this you commence the impaction of the gold by a small retaining point, which is carried forward rapidly from one side to the other in the upper portion of the cavity, until it is filled thoroughly and properly. The advantage of this dam is further seen in finishing off your filling, there being no laceration of the gum.

True some very inferior cavities in the buccal surfaces of superior molars may be very readily filled with pellets without the trouble of introducing the dam. They must indeed be small in size if you obtain the same perfection that you will obtain by the use of the dam.

When the mallet was introduced several years ago, I was so unfortunate as to write an article for the Cosmos, in which I gave several reasons why it should not be used. I thought however, before I should pass from the stage, I would make a third trial. I commenced its use first on ordinary cavities, and found at the close of the day that I was not as tired as when I used hand pressure, and only about one patient in ten would express a dislike for the mallet and prefer hand pressure. I continued to use the mallet, soon, however, dispensing with the one ounce wooden mallet, and using the five ounce and a half mallet. I rejoice that the mallet was introduced to the profession by Dr. Atkinson.

Very much has been said with reference to preparing and filling pulp cavities, and the material with which those cavities should be filled. It has been said that oxy-chloride cement is as good as anything else: also, that Hill's stopping, when it could be well deposited in the root, was as good as gold. It is my opinion that there are very few gentlemen who have so carefully studied this matter as to be able to determine that these two materials are nearly as good as gold. I believe that as gold is superior to either in crown, proximal or labial cavities, so also is gold superior to either in the roots of the teeth.

Dr. Rehwinkel: Under all circumstances?

Dr. Wetherbee: Under all circumstances, whether it rains or shines, blows high or low. It is said as an objection to the use of gold, that it is more difficult to fill the cavity with gold.

Be it so: then you should educate your head and your hand, so that both will be equal to the task. The professional man should know no defeat where it is possible for intelligence to gain a victory. Gold can be carried where nothing else can be carried, with a certainty and positiveness of which you have no knowledge concerning the other operations.

Again, gold is preferable in the roots of teeth to oxy-chloride, not preferable to a filling of Hill's stopping that is positively perfect.

With reference to the removal of salivary calculus from the teeth, of which nothing was said in the report, I believe that the subject is neglected in some quarters; not that there is any gentleman here who does it. It may be well to remind you that we should be diligent in our search after salivary calculus. It has done serious injury, and is doing serious injury to-day, from the fact that it is overlooked. There are, as a general thing among the profession no well constructed instruments for its removal, therefore they fail often in diagnosing cases to reach to the extent of it, and if they are aware of its still further extension they are unable to reach it for the want of instruments therefor. It seems requisite, therefore, that the subject should receive more careful attention and consideration than it has heretofore received.

Dr. Thomas: I rise simply to express my entire approbation, with some very slight modifications, of the report of the committee upon this subject. When a child has been placed upon low diet for any length of time and then has access to the good things of this life, he is very apt to go to excess; his appetite will lead him away. I believe that any operator in general practice at the present time, who has had placed in his hands the facilities for operating that we have had for the past ten years, will quite agree with any one that should make the assertion that we are really in advance of the past, in perhaps, more than a hundred fold ratio.

So far as the report upon this matter of operative dentistry is concerned, I believe if every gentleman in this room were to take the report and analyze it, and take it up sentence by sentence, or in other words subject by subject, as they were presented, he would quite agree with it. I have no interest in the

report, nor in the gentleman who presented it, but I have within the past ten years seen the folly, I think, of a great deal of this progressive operating, as it has been called by many. Do not understand me, however, as implying that I would attempt to throw a wet blanket upon the progression of the present day.

I do not propose to discuss the modes of operating at the present day. I take it for granted every gentleman in the room is familiar with them; but I have felt for the past two or three years that I am just prepared to commence to investigate in relation to this matter of operative dentistry. Five years ago I was almost ready to exclaim that any man that did not use a heavy foil was very far behind the age, but when I see operations that were performed twenty, thirty and forty years ago with non-cohesive foil, with smooth points, by hand-pressure, when I see them good to-day, the teeth preserved, I am led to stop and consider whether we are perfectly justifiable in throwing aside all of these old appliances, these old modes of operating as they are termed, and at once accepting all of the new and progressive methods and modes as they come before us without a thorough investigation; and if we shall but take the middle ground that was so strenuously advocated in the paper, I believe that that will be at all times safe. Every one is apt to think that the appliances that he has been using for the past two or three years are the very best appliances. I have labored under that difficulty myself. I have felt that certain appliances that had come into my hands were the very best that could be made use of, and have advocated them very strenuously and very earnestly, but I think it is dangerous ground for us to take at any time, to denounce any old thing that has been used, and attach ourselves to any new thing that may come up, without a thorough and proper investigation.

The paper referred to the cutting away of the tooth substance. The author believes a great deal of tooth substance has been cut away that was non-essential. I fully endorse that. I have done it myself. I believe that a great deal more has been broken away and lost after the patient has passed from our hands by reason of too much force, than has been cut away at the time; but I believe we have been greatly at fault in both cases, and I also agree with Dr. Crouse when he states that we are greatly at

fault in leaving our operations before we have cut away enough.

We should, then, pursue a happy medium, in order that we may be able to produce the very best results.

Dr. BUTLER: It has been stated that there is more time spent than formerly, and objection was made to the amount of time. I doubt if more time is spent upon the same class of gold fillings. It is well known that quite a different class of operations is demanded at the hands of the profession now, than was twenty, or even fifteen years ago; so that if more time is spent it is an absolute necessity. There are many large compound fillings made of gold to-day, that a few years ago were not even thought of. The greater degree of refinement and cultivation there is among any class of people the more demand there is for fine work of all kinds. They must indulge in luxuries as well as necessities, and finely finished fillings and operations upon the teeth are absolutely demanded. It is also a fact that in the arts fine productions must take time. Finished pieces of jewelry require time to manufacture. The article can be wrought up into form quicker than it can be finished; so in putting in gold, the impactment of it is but a small part of the labor and the effort that is demanded to make a complete operation.

Another speaker spoke of the pain in applying the rubber dam. Dr. Wetherbee spoke of the use of thin rubber, but I do not see wherein it is superior to the thick. It causes more pain to draw it down and turn the edge so as to make it impinge tight upon the neck of the tooth than it does the thick; and I cannot see where it would cause much pain and annoyance to draw the thick rubber down. Those that have become somewhat expert in the use of the rubber can use a much thinner article and put it on securely so that it will exclude the moisture without any difficulty, by simply leaving a little more space so that the tension upon it will not draw it off and it can be turned down between the margin of the gum and the neck of the tooth with very little pain, but I believe it cannot be done as well as with thick. I do not believe time is wasted in putting on the rubber. A little practice will convince one it is not time wasted, but is time saved. Upon a certain class of patients I would not like to operate at all if I could not use the rubber, so that as a matter of security and health to the operator we should use the rubber.

Dr. Wetherbee, in speaking of the filling of canals, said that gold could be introduced more perfectly, and more thoroughly than anything else. I cannot conceive how you can take a substance that is not plastic and force it into the canals as well as you can some plastic substance. If these preparations are objected to alone, you can take a little coil of gold and carry it in with it; and it certainly does seem to me that it will force itself into all these little inequalities of the canal more perfectly than it is possible to force gold.

With reference to the use of different preparations of gold, I apprehend no rule can be laid down. Each one seems to be able to work that out for himself, although I can conceive where it would be advantageous to those that are seeking to know the best, to give something like a rule or general mode of proceedure, but to go on and detail just what class of cases could be best reached with cohesive gold and what with non-cohesive, is something which would seem to me unseemly in a body like this. It is well known as a general rule, that where there must be anything like a restoration of the crown, cohesive gold must be used, but this extra-cohesive I am not so sure can give us the best results. It is quite laborious to work, and the walls of the cavity are likely to be powdered and crushed a little, and the crystals broken up in the impacting of it, thus giving an imperfect work, with all our effort, whereas if the softer preparations were used it could be made perfect, or not break up the edge so as to spoil the whole thing in a short time.

I am not familiar with the use of what is called heavy gold, not being in the habit of using anything beyond No. 60. If I were to be confined to one preparation I would prefer No. 30.

Dr. KNAPP: I have been very much pleased with the report on operative dentistry read by the Chairman of that Committee. It is a document very worthy of our consideration. It commends itself to us from its candor and from the truthfulness of its statements. It is very easy to criticise a report. Anybody can state that a report has omitted certain important points and that in every particular it is not exactly right, in accordance with their views and notions. Let those who thus criticise a report try if they can make a better one.

I commend the report wherein the author asserts that there is

at the present day, far too much cohesive gold used, compared to soft gold. He advises the profession of this fact and states to them that more good can be accomplished by using soft gold in a very great variety of cases. The author of that report neither advises nor disparages the use of cohesive gold. It is certainly a good thing in its place, but I disapprove of the indiscriminate use of it. It is patent to you all that cohesive gold requires a greater amount of force, and greater pressure must be given upon it in order to adapt it to the walls of the cavity than is the case with soft foil. Hence we may more safely use the latter in cavities where the decay had been very extensive, rendering the walls too frail to admit of the greater force required upon cohesive gold.

It has been shown that it is not the amount of gold that can be put into any cavity, that is essential, in order to preserve teeth. It has been shown that there is a certain degree of hardness and density which need not be attained. I see young members of the profession about me cheering and clapping when some one of their number makes an assertion that no man can do fine work or perform excellent dental operations, in the way of filling teeth unless he makes exclusive use of cohesive gold foil, the mallet and the rubber dam. It seems to tickle them very much when these strong assertions are made, proof of which is not given. I would not disparage cohesive gold, the rubber dam nor the mallet; all of these are good in their place.

Dr. Crouse appeared to differ from that part of the report relating to the filling of certain cavities without the use of the rubber dam, making the assertion that it was utterly impossible to fill cavities therein described in anything like a perfect manner without the use of the rubber dam. I think when the gentleman gives the subject a little further reflection, when he comes to a knowledge of the fact that should be before him, that very excellent operations have been performed by a number of operators in the profession without the use of the dam, in the cavities indicated in the report, he will see the error of the assertion which he made. The report you recollect was moderate. It was expressed in mild terms, and took a medium ground. The author of that report did not tell you that the rubber dam was not required in certain cavities. He specified those in which, in

his opinion, it was necessary, and he deprecated the use of it where it was unnecessary, saying that the length of time required was one objection, and the pain and inconvenience to which the patient is put were objections to the use of it, where it is not actually needed, and wherever it can be dispensed with he recommended that it should be avoided. Why put the patient to unnecessary time and inconvenience and trouble in using it indiscriminately in all instances in filling teeth?

The use of machinery was spoken of in the report and the author coincided with my views. He states that it is resorted to too frequently, especially by members of the profession who are unskilled in its use, and who are careless in employing this very effective agency in cutting out the substance; and the assertion therein made that too large a portion of the tooth substance is cut away by the use of machinery, which renders its decay more rapid, is certainly true; wherever there is a large amount of tooth substance to be cut away and it is of a hard character we certainly are warranted in using the burring engine, a very excellent thing for that purpose.

The additional time and the additional pain and expense, in my opinion, incurred by operating after the manner that is recommended by the extremists of the present day, do not warrant us in resorting so indiscriminately to the use of these modern appliances.

Dr. JOHN ALLEN: I have been exceedingly interested in many things that have been said. I was very much interested in the report upon which our discussion is now pending. That report I think dealt very fairly with the subject, and I could not help comparing the state of our profession as it was forty-five years ago with what it is to-day. I almost wonder that as good work was made then as was made. When I look at the various modes that are urged as the best, the different preparations of gold which are better than any other, it calls to my mind the remark of the old German who said it made no difference which road they went to market if the *wheat* was good. That is the great point; if our operations are good, it don't make so much difference which way we go to get them.

The balance of testimony, I think is in favor of soft gold, nevertheless very good fillings were made many years ago, be-

fore these fine distinctions as to soft, hard, and crystalized and all those different kinds of gold were as clearly known as now. I can look back forty years and call to mind many fillings that were put in then, that are yet doing good service. Then we had not the appliances that we have now. Then we did not have the fine manufactures of gold that we have now. There are a great many outside of our profession who have aided us materially in getting up various devices in the manufacture of various materials, the manufacture of gold, and teeth and the various implements now employed. The dentists seem to claim all the credit of these appliances, not giving credit to those to whom we owe them originally.

There is no doubt that dental science has never stood as high as it does to-day with one exception. In the artificial branch of our profession I think there has been a retrogression rather than an advance.

Dr. KEELY: I wish to take exception to one statement made by my friend Dr. Knapp. I understood him to say that with soft foil and hand-pressure there was less danger in packing against frail walls than with cohesive foil and the mallet; my experience is that we can with heavy foil and with the mallet pack to these frail walls with a greater certainty, ten to one, of not breaking them away, than we possibly can with the soft foil. We cannot only pack it more perfectly, but we can lap the gold over the frail edges and protect the enamel. I do not pretend to say that good and permanent fillings cannot be and have not been made with soft foil. I remember when I was in the office with Dr. Allen he called me to look at a filling in a gentleman's mouth; you may imagine my astonishment when he told me that filling had been there forty years. It was a good filling and if he had told me he had just put it there I would not have been surprised.

Dr. KULP: I occupy a peculiar position in this country where I can judge of the results of operations of many operators. I see more operations coming from the hands of different men, and representative men of the profession than almost any other man in the profession. Most of you send your patients west, and instead of going all the way east to have their dentistry done, they come as far east as where I live. I have been thinking over,

since I have been sitting here, how many fillings I have seen within the last year, that were put in by men who are present to-day, and I think I can count twenty-two, and they are mostly representative men. I want to give my opinion as I have based it upon what I have seen as to the results of these operations. I find those who use the rubber dam and have used it from the begining, and those who use the heroic practice of dressing out cavities, cutting away all the frail portions, and filling with cohesive foil are the ones whose fillings show the best, whose teeth are best preserved. In a mouth recently I found seven fillings from the hand of a beloved brother; five of those were very good, and two were poor. That man does not use the rubber dam, nor cohesive foil. He failed in two cavities, because the walls were frail, and it was impossible for him to pack the gold as he ought to have done. I do not find this so, coming from the hands of those who adopt these modern modes of practice.

I have one word to say upon this subject of vacillating; I mean to-day taking No. 60 and tomorrow No. 120, to-day soft, and to-morrow cohesive foil. I believe that is the wrong way to practice dentistry. I have now adopted the plan of sticking to one thing. I believe in following that particular plan; by finding out how we can have the best results and sticking to it, we can always have uniform results. Upon this subject I would most cordially recommend an essay that was read by Dr. Leslie at the Missouri Dental Association last March, because it accords with my own experience most thoroughly.

My own experience is that the rubber dam is a great deal less objectionable to patients than the wedge, and much more acceptable to the operator. While I do not recommend that the rubber dam be used exclusively I would generally say use it.

Dr. Rehwinkel: It is strange that all our discussions, all our arguments now seem to tend to a caution to guard against the abuse of good things rather than the judicious use of them.

If Dr. Shepard, the author of the paper under discussion, has given, in some instances, his individual views and opinions on some methods of practice, they have been expressed in such a way as to leave always the liberty to every other practitioner to do as he pleases, without injuring his status in the profession.

After all, these different modes of practice must necessarily be left to individual discretion.

When we look upon the matter and ask ourselves whether some of the operations can be performed without the rubber dam, some of the older practitioners who have had practice in that way could give us a satisfactory answer. There are many in the room who will say, it can be done and it has been done, but those who have been compelled to do it without the rubber and can now use it, would not think for a moment of doing it without it. I have been compelled to do these very operations without the rubber, and the trouble and mental anxiety and nervous irritation and worry of keeping that miserable little cavity dry has been ten times the trouble of excavating and filling it five times over.

The only objection to the rubber is that it secures the teeth so well and puts the operator so perfectly at his ease that he will be very apt to keep the patient sitting in the chair with the rubber over his mouth, and go into the next room and chat with a patient half an hour!

In my opinion there are young men now brought up in the profession who could not begin to fill a tooth without rubber, or with non-cohesive gold. The preceptor who will allow the student to go out of the office without having him perfect, not only in the use of non-cohesive gold foil, but in the method of filling teeth without the rubber dam, does not do his duty to the student. If any young man will learn to fill a tooth well with non-cohesive foil, and observe all the principles involved in that filling he will very soon acquire the additional qualities and points that a more cohesive gold filling requires.

My friend Dr. Wetherbee last night made a statement that gold is the only material with which the root of a tooth ought to be filled, under all circumstances. I admit the statement is true, so far as it goes, with certain modifications. Dr. Wetherbee and I had a little difference of opinion in Cincinnati on the same subject. I want to ask you, after you have devitalized the pulp of a tooth, and attempt to extract that pulp, and do not bring it all away, (which you do not, in nineteen cases out of twenty) do you believe under those circumstances it is best to fill that root with gold?

Dr. WETHERBEE: In reply to the question I have to say that in all incisors, cuspids, bicuspids and superior and inferior molars, the pulp in every case is entirely removed in my practice.

Dr. REHWINKEL: At what time after the application of the agent by which you devitalized it?

Dr. WETHERBEE: From ten to twelve hours is the best time in the world.

Dr. REHWINKEL: You say that every time, you are able, from ten to twelve hours after you make the application to the pulp, to remove it to the apex.

Dr. WETHERBEE: Yes sir, in every case.

Dr. REHWINKEL: You have very funny and very peculiar people in Boston!

Dr. WETHERBEE: We have very sensible people there, who are more ready to submit to a little inconvenience than to postpone an operation and increase the danger. Besides they have a dentist there who knows his business. (Laughter.)

Dr. REHWINKEL: And my friend ought to add that the people are so sensible there that even their pulps have sense enough to get out when they have no business there. People west of the Alleghanies are not so sensible, and the pulps of their teeth have peculiar notions, and they stay as long as they can stay, and until they have to be removed by *hook* and *crook*, and we cannot remove the pulp entirely from a central incisor in less than from two to four days.

Dr. STOCKTON: I believe in both soft and cohesive foil. I believe that some teeth are filled with soft foil successfully that could not be filled with cohesive, and I believe there are teeth filled with cohesive foil that could not be saved successfully with soft.

We have everything at our hands so completely manufactured —instruments and everything, so thorough and so good that it seems almost impossible that any man who claims to be a dentist can make a poor operation.

One word with regard to the ink experiment of Dr. Fletcher, of England. I have tried that a number of times and I am satisfied that it is a failure. I believe that cohesive gold can be put together so tight and thoroughly that no ink can get around it. I believe Dr. Judd said, in some of his remarks yesterday that we

don't know many things positively, but I am confident that cohesive foil fillings can be put in so thoroughly tight that no ink can get around them, and they are just as effective in saving teeth as are soft fillings.

Dr. Osmond: With regard to Dr. Fletcher's test I have one observation to make, and I think I shall be borne out by many members of the profession. I now assert that after malleting a filling perfectfully tight it can be malleted loose again, and in all probability Fletcher committed that mistake. I have seen fillings malleted loose again: I have done it.

With regard to gold being the only material for filling teeth I would say that I would use other materials under certain circumstances.

Something has been said with regard to the condition of the system of the individual. That alone is not to be considered. There are conditions of the teeth which may or may not have something to do with the condition of the individual. Generally, however, they are found to have some connection with the health of the patient. For instance, if a tooth is deprived of its proportion either of enamel or calcareous matter so that the walls will break down in malleting, I would not use gold because in such cases after the gold filling is put in, if you take a little glass you will find that you have broken up the wall. You cannot build a good house on a poor foundation, and therefore I argue in cases like that it is better to use something that does not require so much pressure. I therefore regard the assertion that gold is the only material for filling teeth under all circumstances, which has been made here, as wrong in principle.

Dr. Bogue: It seems to me that the experience of Dr. Kulp is most valuable, and the results of his experience ought to be taken to heart by us. We do not realize the differences that exist, not only in constitutions but in the individual teeth which we are called to operate upon. Not many years ago Oliver W. Holmes in a discussion upon the degeneration of our race, took occasion to point out a fact which has been demonstrated by the vitality statistics, if I remember correctly, of Massachusetts, that instead of becoming a degenerated race we were absolutely improving. This is in opposition to the generally received view. He said that children who were formerly allowed to die were now, with

the additional knowledge which we posess, reared and made useful in the world. Is not this same condition of things true with regard to teeth? We all know the almost indiscriminate slaughter which was formerly allotted to them. To-day frail, weak, badly organized teeth are filled and saved. Not many years ago Dr. Allport made a statement to me which I remember: "Any man can put a good filling in a crown cavity." I said to myself, if that is so how is it that we find so many poor fillings in crown cavities? And that remark comes to me again in view of the remarks made yesterday and to-day with reference to these old fillings. I venture to say that the majority of them are simple crown fillings. We do not find fillings in cavities of any such magnitude as to-day are inserted by the use of cohesive gold foil and the mallet. Such fillings are not in existence so far as my knowledge goes.

There is a class of cavities, which no one in this room will question can be filled with soft foil, by the use of the napkin and a little labor. In another class, until we got the rubber dam we never accomplished good results to any great extent.

Dr. JUDD: I feel like saying a few words in relation to the various subjects that have been brought before the Association, and first in relation to the report itself. It seems to me that the idea contained in the report, the real spirit that actuated the report as it was presented has not yet been touched upon at all and I propose to allude to that in the first place for a single moment.

I think the idea that prevails throughout the report was that our practice as a general thing should be so modified as to allow us to do operations at a less price. I have some ideas that are not in exact accord with the opinions that were expressed in the paper, and I think that the condition of things will be found, in large cities particularly, to be about this: there is a class of people that are willing and able to pay for the very best possible operations, who are willing to submit themselves to all the inconvience of such operations and who will be satisfied with nothing else. Such people will naturally gather themselves around and patronize operators that do work according to their notions. We must have and we do have and always will have men of exactly that kind, who will spend all the time that is necessary in doing such work, and they will be surrounded by

such patients as those. Then there are others who spend less time, who are less skillful in their operations, that do not expend as much labor, who perhaps may use different methods of operating for the purpose of saving time and expense, and these will be surrounded by another class of patients who will be exactly suited and satisfied with this kind of work. And so we may go down until we come to the man that slips around the corner and looks to see that no one observes him while he dives into a five-dollar establishment for a set of teeth.

As regards practitioners in the country, to a considerable extent they must accommodate themselves as well as they can to their circumstances.

I think the paper was a little too conservative upon the rubber dam. You will see through the whole line of the report, it followed the philosophy of Aristotle—it recommended the mean between two extremes as a general thing. That is a very proper way usually to look at such questions as this, no doubt, but in the case of the rubber dam I think it leaned a little from the medium line, and did not take the mean exactly. I think we should use the rubber dam in a good many more cases than the gentleman enumerated.

I wish to say a few words in relation to this Fletcher question. I think we have given an importance to those operations that they do not deserve. I have a pretty clear idea of the course that he has pursued for a good many years and a pretty clear idea of his standing in England among the best men of the profession there. Fletcher is an exceedingly sharp man who makes amalgam and cement to sell. That is his principal business I think, and his next most important business is to advertise these articles to the profession, and in this very article in which he first brought out what he stated was a fact in relation to cohesive gold he went on to state that Fletcher's amalgam was not liable to such objections. I have consulted some of the first men in England upon this very point, in relation to his standing there as a dentist and an honorable man and an operator, and they have confirmed me in the views that I had formed before.

The recommendation of tin in large cavities I am not quite ready to endorse. It strikes me that this thing of using tin instead of gold amounts to just this, that we save in some large

cavities a very small amount of gold. The gold that it takes to fill a cavity, as a general thing don't amount to much. I do not pay any attention to how much gold I put into a cavity; I am not selling gold for a living. I charge for my time and my skill, and I intend to charge for the little knowledge I have acquired by experience and by observation, but beyond that I do not propose to charge. It seems to me as if the consideration was too small to warrant our discussion. I have no question but what soft gold works as easily as tin and we can make a filling of it as readily and with just the same labor and time as with tin.

A great deal has been said in the last ten or fifteen years as to cutting out all of the fissures in filling teeth. I am pretty certain that some person will misunderstand me before I get through. I have spoken upon this subject before, and attempted to speak as plainly as it is possible for me to speak, and I have almost always been misunderstood. I commence with asserting that in the majority of cases teeth are not cut out enough, but I want to call attention to one thing, and that is that these fissures are not necessarily the places in which decay commences, that is to say there may be fissures in which decay never commences. These fissures are natural fissures in the teeth. If we say we must at all times cut out all fissures we shall have an enormous amount of work to do every time we place a filling in the crown cavity of a molar; but the distinction I wish to be made, is that I recommend the cutting out of all fissures, so far as there is any indication of decay, and beyond that I am unwilling to go.

I believe in filling the canals of teeth with gold, I do not believe in filling them with cotton, and of one thing I am absolutely sure that there is no better material than gold to fill the fangs of a tooth with; and I have been somewhat gratified that during this discussion I have seen no man here yet that arose and advocated the filling of teeth or the filling of the fangs, or root canals with cotton. I consider that a mark of progress. But as to the possibility of filling the canals with gold to the apex I have my doubts, or rather have not any doubt about it, for I am perfectly satisfied that it cannot always be done.

I have been employed in the last three years a considerable part of my leisure time in examining and writing up, as far as I was capable, a description of the canals of teeth and the fissures

of teeth; and in doing that, it has been necessary for me to examine a great many specimens, and I am absolutely certain that in a great many instances certain fangs of teeth cannot be filled to the apex, in fact no instrument in any way or shape or manner can be carried through to the apex.

Dr. WETHERBEE: I did not say in my remarks, or if I did I did not intend to, that all pulp canals could be filled to the apex. I said where you could fill with oxychloride or cotton or Hill's stopping, I would fill with gold.

Dr. JUDD: I am very glad that was the statement.

Dr. SHEPARD: This discussion has proceeded with quite as much interest as I had any expectation of calling out by my report.

There have been a good many unintentional misunderstandings and misrepresentations of the spirit of the paper, but on the whole I am thoroughly satisfied that the stimulus thus given has called out so full an expression of the views of so many members. The truth is that the great majority of people are poor or in moderate circumstances and nearly all are sufferers. The great majority of the dentists of this country must be dentists to these poor sufferers if their teeth have any care at all. A few are happy in ministering to the rich and can charge for time and skill, as the last gentleman said. It makes little difference to him or to many of us whether gold, tin or other material is used, the cost of the material is comparatively nothing; but the good dentist to the poor cannot put into a tooth gold which costs two, three or five dollars, and get back his money together with a fair remuneration for the long time it takes. The sufferers throughout our land must be attended to by some means. The dentist to the poor, who faithfully operates for one dollar an hour is just as respectable, just as much a benefactor of the race as he who gets ten dollars an hour for his services. A false standard of estimating a man's prominence by the extent of his fees, has obtained to too great an extent. I think it is high time that this Associatian as a representative body should make prominent the idea that it is not high fees, nor the fact that a man ministers to the rich that makes him to be respected by the profession and the public, but that he adapts means to the end, so as to do the most good to the people to whom he ministers, whether rich or poor.

As a natural result of this false standard, it is almost impossible in college instruction to get the student to care anything about learning how to use non-cohesive gold, or operate without putting on the rubber dam, or in a word, to learn how to save teeth with the least expenditure. A sadder result is seen in the terrible slaughter of the innocents, to make room for cheap artificial dentures, especially by country practitioners, who are and ever will be the majority of the profession.

I have practiced a good many years in the country and know how it is, for which experience I am thankful, and from which perhaps mainly springs the argument I have made for the respectability of cheap dentists and good, cheap dentistry.

I have no reply to make to those gentlemen who in criticising the report, have found fault with it for not doing what they have taken your time to do, namely, entering into a minute description of how to do this, that or the other operation.

Dr. McQuillen: The fees of a dentist do not give him reputation and position; it is the character of his operations. There is danger of cheap operations for the poor being misapprehended. Some of the best operators in the cities are supplied from the country. The talent of the village seeks the city, to enjoy the fruits of a reputation made by performing good operations for a small compensation. The best work should be done under all circumstances. I am opposed to the practice of filling roots with cotton.

With respect to fissures in the enamel, the finest probes should be used in making an examination of the teeth, and where such an instrument catches, the place should be cut into and filled. These fissures, microscopical in size, often lead to dentine in which the interglobular spaces are abundant, or otherwise defective in structure, and sometimes they open into cavities in which caries has accomplished its work of destruction without presenting any external evidence of the fact.

Dr. Allport: I did not have the pleasure of listening to the report of Prof. Shepard, but from the many compliments paid it I conclude that it was worthy of its author. I have not taken the pains to make notes of the particular points upon which I wish to speak and there are so many things that could be said in connection with this subject that I hardly know what to say.

I wish first to notice the remarks made in regard to the experiments of Mr. Fletcher, of England. Mr. Fletcher, it seems wished to demonstrate that cohesive gold could not be so accurately packed against the walls of a cavity, as to exclude moisture. To do this, he filled the cavity in a glass tube with cohesive gold and then immersed the tube in ink and it was found that the ink was secreted, or found its way between the inside of the tube and the filling—while a filling put in from non-cohesive foil did not admit of the passage of the fluid around it. From this experiment Mr. Fletcher concludes that perfect-fitting fillings cannot be put in with cohesive foil and that it is therefore unfit for use. Whether Mr. Fletcher has sufficient skill in operating to make his experiments reliable in such matters or not, I am not informed, only so far as what I have heard here to-day and by his own showing from the experiment he has given us. That some of our most careful and skillful operators can, under favorable circumstances, pack cohesive foil sufficiently well against the walls of a cavity to make good operations, no one who has seen their operations can doubt. But because, with great care and skill, good fillings can be put in with a material difficult to manipulate, is no reason why it should be recommended for general use. The question to be determined in adopting or recommending a particular preparation of gold for filling teeth with, is not whether Dr. Atkinson, Dr. Cushing, or our late friend Dr. Varney have been able to put in good fillings with it, but what kind of gold can with the greatest ease be accurately adapted to the walls of a cavity and the greatest number of teeth saved with it, by the average skill of the profession? The gold that should be recommended for general use, is that which the average operator can accomplish the best results with, can save the greatest number of teeth with. Many operators seem to think that in order to make a good filling, the gold must be cohesive, so that it will weld into a solid mass. Now, this quality in gold is only necessary when it is desired to build up and restore the shape of a tooth, and it is a very different operation from that of filling a cavity in a tooth, and necessitates the use of a different kind of gold from that which can be most easily adapted to the walls of a cavity and best excludes moisture and saves a tooth from decay. I do not advocate soft fillings

still it is not necessary that gold should be welded into a solid mass in order to make good fillings—fillings that save teeth. If any one doubts this, let them examine some of the old fillings of Harris, Maynard, Badger and Rich, or of our other old and good operators. We frequently find some of their old fillings so soft that an instrument can be stuck through them anywhere and still they are preserving the teeth, although they have been there fifteen or twenty years. And why is this so? Simply because they used soft, or non-cohesive foil, which was readily adapted to the walls of the cavity. But examine a large majority of the fillings put in with heavy or highly cohesive foil, by good operators of to-day and what will you find? They will be as hard as bullets and highly polished, but nearly worthless so far as saving the teeth is concerned, simply because the gold is not acurately packed against the walls of the cavity, a thing difficult to be done with highly cohesive foil. There are cases where it is almost impossible to get along without cohesive foil and make satisfactory operations. And it often happens that both kinds of foil should be used in the same cavity, but at all times, when it is possible, soft gold should be packed against the walls of the cavity and the result will be, fillings that the teeth will not discolor or decay around. It is very difficult for ordinary operators to pack highly cohesive foil against the walls of a cavity. It is exceedingly deceptive. They make retaining pits where they fasten the gold and because it does not tilt or rock in the cavity while being finished, they think they have good fillings. These fillings are finished and look finely, but wait three, five or ten months and in a large majority of cases, where these fillings have been put in by ordinary operators, the teeth will be found discolored or decaying around the fillings; so I say that while our best operators may put in good fillings with highly cohesive foil, it should not be recommended, or adopted for general use by the average operator. It has been said that by the use of highly cohesive foil, with mallet pressure, teeth with frail walls are less apt to be fractured while being filled than by the use of non-cohesive foil, with hand pressure. That harder fillings may be put into this class of teeth with cohesive gold in this way, than with non-cohesive foil, I have not a doubt. The reason is this: the more cohesive foil is, the more it contracts, or

rolls up under pressure and draws from the walls of the cavity while being packed. The result is a hard filling, but one that does not fit or press against the walls of the cavity. As the gold does not fit tightly to the walls there can be no pressure against them, hence the enamel is not apt to be fractured, but in such cases moisture is sure to penetrate around the filling and the tooth discolor and decay; a result so frequently seen in this class of cases at the present day.

One word in regard to fissures. Dr. Judd says, that in cases where decay does not actually exist, it is not necessary to drill them out. Dr. McQuillen contends that in all cases, where an instrument will catch in them, they should be drilled out. As Dr. Judd says, fissures in teeth are natural, and they may sometimes be deep with no presence of decay. Any one accustomed to the use of the microscope and to examining these cases will tell you that these fissures will frequently be so deep as to allow an instrument to catch in them and still there will be no decay. As a rule, it is well to let well enough alone, but if there is an absolute decay and deep fissures running out from it, and the walls are soft and frail, in such cases it is well to drill out the fissure, whether they are decayed or not and fill all as one cavity.

Dr. PALMER: Between all metals that we insert, and the teeth there is chemical or galvanic action. Some will take issue with me when I say there is chemical action between gold and tooth bone. You have a right to do so unless you have investigated and been convinced to the contrary. I speak of chemical and galvanic action in terms synonomous. I care not which you use. I have no authority for it from the text books that I am aware of, but wherever we find chemical action we have galvanic action. If chemical action precedes it, galvanic action is on the wings of lightning and it will not take a long time to be present. You who understand the formation of a battery know that it is necessary to have two perfect conductors and one imperfect conductor, or two imperfect conductors and one perfect conductor. These shall, all of them be more or less conductors of electricity, or one of them shall be a fluid. Constructing the ordinary galvanic battery call the copper negative and the zinc positive. The acid is thrown upon the zinc, which is consumed

—that is the positive. It has been generally regarded that bone was not in general a conductor of electriticy, consequently no action existed between the acid and the tooth bone, but through that instrument which follows immediately after the microscope and which is the instrument which is to reveal to us the greatest discoveries in our science, next to the microscope, the galvanometer, it has been found to be otherwise. I made the test by taking a tooth and pulverizing it in order to increase the surface, and put it with gold in diluted acid. We are enabled by this means to measure our chemical action in a very few minutes, and determine which element is being consumed.

It has been stated that gold is a pure metal. So much the worse for the opposing element. We have the gold in the tooth which is the negative element. We have the saliva, the acids, or whatever may be present in the mouth, and we have the alkaline portions which are the positive element. We take tin for instance, and place it in opposition with the gold with strong acid and the effect will be to throw the tooth bone into the positive relation. Consequently we take any strong acids and the tooth bone would be consumed, but simply take and change it to an alkaline solution in the place of acids and we reverse the order. We have now thrown tin into the positive condition while tooth bone is restored or thrown into the negative condition. Any one who understands the laws of galvanism knows that by the presence of any substance in the tooth which is positive to the tooth, action must come upon that, and it will tend to preserve, if not preserve the properties of the other element in the battery; and it is as clear to my mind as anything can be, that the tin filling in a loose porous condition preserves the teeth because the tin itself is being consumed, and the tooth bone around it is rendered negative.

That answers the question to my mind perfectly clearly, that we have been puzzled with, regarding the antiseptic or the peculiar properties in tin filling to preserve a tooth. Understand I am not speaking to advocate or advertise the use of tin, but I must say that I prefer to fill with it in the six year molars, and for children for that reason not on account of expense.

Dr. WALKER: Our friend from Boston maintained that because gold was the best material in certain cases it was the

best in all cases including root canals. On this point only I wish to take issue with him. I believe it will be generally conceded by all close observers outside of Boston, that to remove all the material from the pulp cavities of very many root canals is out of the question. I hold that the properties requisite in a material to make a good root filling are quite different from the qualities requisite in a material to make a good crown filling. In the crown filling we want just such a material as gold, the only thing that will answer the purpose, but in a root filling it is not necessary that we should have a material that will resist magnetism or chemical action. We want something that will occupy the space thoroughly and that has an antiseptic property also. I hold while it is impossible in a large number of cases to make a perfect gold filling in the roots, on account of the peculiar fissures, on the other hand it can be done with a preparation of Guillois' cement. I take several broaches well softened, of different sizes, wrapping a little cotton upon them and with these the cement can be pushed into every portion of the cavity. In that way I maintain that a perfect root filling can be made with a material that answers all the requisites.

Dr. KNAPP: I desire to offer a few remarks relative to one part of operative dentistry, which was omitted in the report. I refer to cases of hemorrhage that occur after the extraction of teeth; it is well that that part of operative dentistry should receive from us a good share of attention. It seems that failures are often made to arrest hemorrhage which occurs after extraction. Most cases that occur, those that are not very obstinate, can easily be stopped by a wedge of cotton held in the jaws pressed down upon it in such a way as to produce a fair amount of pressure. When this fails I want to state a very easy and simple method of overcoming the most obstinate case of hemorrhage that can arise after the extraction of a tooth. Knowing as you do the shape of the root of the tooth that has been extracted, make an imitation of that root in wood, whittling out with your knife a piece that will exactly fit the socket from which the root was extracted. Then it can be cut off so that it will project a little after it has been inserted, the more easily to effect its removal when desired. After having fitted this to the socket ridding the socket of the old clotted blood that had accu-

mulated therein, it will be easy to cut a few little creases around the apex of this wooden root and into those creases can easily be twisted a few fibres of cotton. After that has been done it is an easy matter to saturate the apex of the wooden root and charge also the fibres of cotton twisted around it with a moderate quantity of the French preparation of perchloride of iron. Being thus charged, the wooden root is then to be inserted in the socket or alveolus whence the bleeding proceeds. Any one can easily arrest the most obstinate case of hemorrhage in this manner.

Dr. ATKINSON: I think I can show you a much easier, certainly a more rapid way, taking exception somewhat to the gentleman's statement of facts. He instanced a case of hemorrhagic diathesis and then produced a case to treat that was entirely different from that. The bleeding that occurs from the end of the socket whence the root is removed, is not such a case, it is not hemorrhagic diathesis. Why does the socket continue to bleed? Simply because the artery that enters the hole in the end of the root is broken off, leaving its attachment on all sides of the socket so that it is open. That is the reason why it continues to bleed. Hemorrhagic diathesis involves the capillaries and the gums, and I won't go into that just now, because that don't come quite to the point. You need not be so extra careful about whittling your sticks, but take a burr that will be sure to be large enough to embrace the entire end of that socket, and put it down and give it one turn through the clotted blood, and kiss your patient good bye!

Dr. KNAPP: You don't dispute that my method would be effectual.

Dr. ATKINSON: I do dispute that it is as well to go to New York by an ox-team, as to go in a car that is already prepared to go.

Criticism is a two edged sword, it cuts both ways and the criticiser may be criticised by what he says just as legitimately if he is in the presence of good men, as the individual whom he hopes to criticise. Criticism is used in the commom acceptation of the term simply as fault finding. That is not legitimate criticism at all. Legitimate criticism means to put things to a test and have the truth appear. If we could rise above the little bickerings, the differences of opinion in details, and grasp the general princi-

ples that ought to be promulged and established in this body, we would be able to exercise that kind of fairness that would enable us always to properly appreciate what each individual says.

The spirit of the report on operative dentistry I admire very much, and have very little criticism to make, certainly no fault to find with the manner of its presentment, and the only suggestion that I would have to make to chairmen of committees making reports is to give less of individual opinion and more of the statement of proved principles. Into this discussion has entered a great deal more of the mechanism of filling teeth and very little of an understanding of the principles by which mechanism alone can be properly brought to bear.

I venture that I shall not be opposed by any intelligent operator when I say at the cervical walls of the cavities an immense preponderance of failures take place. Then where do we need to be most careful, and what constitutes the greatest care? Keeping the locality in such condition as to enable us to see, so that we can tell when we have got on a sound basis. That may be done by wedging or by the rubber dam. How anybody can fill under the gum satisfactorily without the dam I am at a loss to see. I used to dress over night all such cavities with cotton saturated with creosote, so as to kill the gum back far enough to get it beyond the margin of the cavity. With the rubber dam all that is necessary is to cut away the excess of gum and drill a hole into the root of the tooth sufficiently large to allow a screw to be put in and then put on your rubber dam, hook it over that screw and when you have finished your work finish off the screw, with the rest of the filling.

Some advocate heavy foil, some light foil, some non-cohesive foil. Do good work by whatever means pleases you, but by all means do good work. I have not backsliden any further than it is backsliding to go to 30 since the introduction of heavy gold, and I don't see any necessity for it. I have seen from the hand of the best operators failures because of the want of appropriate packing. One other failure that holds in our highest Israel is made, even among our best dentists. We have but a very sparse thinned out minority that will obey the law of contour, that will take the shape of the tooth and restore it to the form it was before it was decayed, and until they do that it will not be perfect dentist-

ry, in my opinion. Until we so build out the gold as to bring the contour of the filling to impinge upon another approximal filling, or the face of the sound tooth so that you can bite even tough buffalo beef through every time, you will fail to accomplish the highest good, and you will fail to have met the requirements of the case. The human teeth stand in the jaw in a relation analogous to the staves of a barrel, and you cannot afford to lose the first one of them. You can hardly afford to lose the wisdom teeth. They are proper abutments; and it is this breaking of the arch that lays the foundation of the mischief, almost invariably.

I don't think there is any difference of opinion in the whole house, if we get at the opinion of men, with regard to the report made by Dr. Shepard. He said good cheap dentistry. What is cheapness? It is that which gives the greatest amount of service for the least amount of expenditure. Cheapness don't mean low pricedness by any means, for shoddy don't begin to be as cheap as the finest kind of well prepared material, and more especially so with regard to the tissues of our bodies. We must remit all these questions that are mere questions of price to the individuals themselves to settle, and I have yet to see the first man that does not ask enough for what he does.

Dr. Webb: Instruments of almost every conceivable form with the smooth, plane, or convex point along through various grades of serrations, the broken point, the alloyed gold point—all have been used and eulogized. The cohesive property of gold was recognized, and then Dr. Atkinson introduced the mallet as a valuable aid in the impaction of the precious metal, and both were adopted.

To-day the cohesiveness of absolutely pure gold is deemed quite sufficient for all purposes as a filling, except that it is best to pass it through the flame of alcohol when the operation is to be carried to a restoration of contour.

To-day also we have electricity applied as a force for the impaction of gold, and those who have used that representation of true genius, the improved electro-magnetic mallet, cannot but feel thankful to the inventor for it. The lightning-like blows impact the gold to a greater degree of solidity than has otherwise ever been accomplished.

Dr. Taft: The preservation of the exposed pulps of teeth is a very important matter, one of the most delicate and difficult things with which dentists have to deal. It is a very important matter to conserve the life of the teeth and I am sad when I hear men continually talking about destroying pulps, poisoning them to death and sacrificing them, taking them away. That seems to be their whole thought and their whole inclination in this particular, to poison pulps and extract them and destroy them by any and all means possible. The pulp of the tooth is second only, if it may even be regarded second, to the presence of the tooth itself, because the value and usefulness of the tooth and the comfort that a person may have with it is dependant largely upon the presence of this body or tissue in the tooth. There are a great many persons with whom the destruction of the pulp is equivalent to the destruction of the tooth. There are many others with whom the removal of the pulp, under favorable circumstances and proper management does not immediately endanger the loss of the tooth. But even under the most favorable circumstances the loss of the pulp in a very little time insures the loss or the detriment of the tooth itself. A process of deterioration begins the moment the pulp is destroyed. Its course is directly onward, sooner or later to the ultimate destruction of the tooth. That ought to be engraven with a pen of iron upon the mind of every dentist, and whenever he destroys the pulp of a tooth that fact ought to stare him in the face and deter him from ever doing it again. A great many say, I cannot save the pulp of a tooth. I hardly know how to answer such an objection as that. I know that men in the profession do save the pulps of teeth with great facility and in almost all cases. One may fail now and then, but that is not an argument against the effort to preserve the great mass of pulps of teeth as they are presented in practice.

How will the work be accomplished? By pursuing a rational, reasonable course, as you would in the treatment of any other tissue; not do the same things perhaps, but a knowledge of the structure, a knowledge of the conditions through which it passes, from its exposure, from the time of its taking on an abnormal condition to its death, will enable us to know what to do, just as

well as the physician, by his knowledge, will know what to do with the patient in the different stages of different kinds of affections. When the pulp of a tooth is exposed there are of course many conditions present. A tooth may be exposed by excavation and not be in a diseased condition at all. You know what I mean by that. The pulp may be in a state of comparative health and in a condition such as to enable it to be closed up and it may return to its former condition and live and perform its functions. When a pulp is exposed in this manner, and in this condition it should be simply closed up, so as to be brought as nearly to its original condition as possible. Cover it with some substance that will not be decomposed in contact with it, some substance that will be as much a non-conductor as possible, that will not impinge upon the pulp. Seal it up in that way and then fill the tooth and all will be well. If the tooth has been exposed for some length of time and has become inflamed and is painful and in an abnormal condition, what particular thing ought to be done for its restoration will depend very much on the conditions present; both systemic and local conditions must be recognized.

Dr. Rehwinkel says in his neighborhood there is so much malaria that he cannot save the pulp of a tooth. He says they have to take quinine by the ringing of the bell. How much there may be in that I don't know; but one thing I do know, and every intelligent dental physician will bear me out in this: systemic conditions must be recognized and systemic treatment must be made to conform to the conditions present. It will be utterly impossible to succeed in many cases without systemic treatment. Local treatment will also, in most cases be required, and what is the first movement in local treatment? It is simply to clear away the *debris*, to remove everything that will serve as an irritation to the exposed tissue, accumulation of foreign matter within the cavity of decay, dentine or anything of the kind that would serve to irritate the pulp of the tooth, and after this, something to correct any offensive condition that may remain in contact with the pulp should be applied, oftentimes merely that which will disinfect, and many things will accomplish this. It is difficult to give a formula for anything that will be applicable, strictly to all cases. Carbolic acid, chloroform, spirits of camphor,

permanganate of potash and many other things may be employed. If the pulp is inflamed, has taken on an abnormal or diseased condition, the treatment will be modified by the stage in which it is. It may be necessary to deplete. Sometimes that is a good thing, but not always. Oftentimes depletion by mere puncturing of the pulp is the thing to be done to relieve the distended vessels, upon the same principle exactly that depletion would be performed anywhere. Then stimulants to increase the circulation within the tissue and so relieve it in that way. In some cases tonics and astringents may be applied to give tone and strength to the vessels within the tissue.

The object is simply to relieve the part and bring it to a state of health by such treatment as will reduce the inflamed condition that it may be in. But even if it has gone on to the stage where pus is thrown out, pulps may then sometimes be restored to life and saved. I know there is an opinion entertained by some that so soon as there is a discharge of pus from the pulp it is a gone case, that it may as well be destroyed at once. I do not know what Dr. Rehwinkel will say about that. I know that pulps can sometimes be brought to life and can be maintained in that condition for a long period of time, even if they have come to the state of discharging a small amount of pus from them.

I have been using for a couple of years simply oxide of zinc with creosote or carbolic acid to apply over the pulp, because it will occupy all the space, will not make pressure upon the pulp, will cover it up completely and will not be offensive to it. When I can have the entire treatment of a case, especially if it has been one that has recieved some treatment, I prefer to let it remain a time before filling it with gold. Within the past two or three months I have been using lacto-phosphate of lime, or lactic acid and phosphate of lime. I use the lactic acid and phosphate of lime because I can keep them without deterioration. The method I have been pursuing is to have the lactic acid and phosphate of lime separate, and when a pulp is brought to a condition to be covered up, I take the phosphate of lime and lactic acid and make a paste of them, and place it on the pulp in the manner I described with the carbolic acid and oxide of zinc.

Dr. Thomas: I quite agree with Prof. Taft when he says

that we should endeavor to save every pulp that comes under our observation, whether it has been exposed by accident in excavation, or by the action of caries, and I am of the opinion that every one in this house is well settled as to the propriety of this practice. But there is another class of cases that has not been touched upon, that is teeth that remain in the mouth after the pulp has been devitalized. Such cases have given me a great deal of trouble, and they are constantly giving young practitioners trouble.

I formerly treated such teeth through the canal, by enlarging the opening, and was almost invariably troubled to complete the operation within a period of perhaps a month. Within the last two years I have followed a practice which had been recommended to me, viz: cleansing and filling the root at once, and then making an opening through the gum, down to the apex of the root, not with an excavator or a pointed instrument, but taking a lance and opening it freely, and then trepanning the bone; then I apply the remedy.

Of course judgment must be used. It depends on the nature of the case how much must be excavated, but I believe in cases of that kind all that is required will be one application.

Dr. Rehwinkel: I am as anxious as anybody in the house to save a pulp. I would avoid however going to the extreme in that direction, as I am careful to avoid extremes in other directions. I have a great admiration for positive men, because of all things in the world I admire a man who is where I know I can find him.

It may do very well for a professor of a college who scarcely could do otherwise, to state that it was scarcely possible that a case could arise in which the pulp of a tooth could not be saved, by some means or other; I, not having that responsibility upon my shoulders am at liberty to admit in my humble judgment that there are cases where we serve our patients better and where we do our duty more fully when we destroy it in the best and most harmless manner that we know of. I have moral courage enough to state here that I don't think it wrong, on the contrary I consider it good practice under certain circumstances to resort to the use of arsenic for the purpose of devitalizing the pulp. I

don't do it in all cases, but when I make up my mind to kill, I want to do it promptly, I don't want to do it by inches or by degrees. I don't want the tooth pilled to death, I don't want to fill around it and kill it by degrees; whenever I come to the conclusion to kill that pulp I do it with one blow, and I use arsenic, and I have yet to see the first case where bad results could be clearly and unmistakably traced to the effects of arsenic.

Nine-tenths of all the pulps are doctored to death. The simpler the treatment the better it is, and the greater the probable success will be.

Dr. CUSHING: At the meeting of this Association held at Nashville three years since, a paper was read entitled "Light versus heavy gold," in which the author, Dr. Abbott, claimed to establish by experiments therein detailed, the fact that a cavity well filled with soft unannealed gold of light number, would contain a greater quantity of gold by weight, than the same cavity would contain if equally well filled with heavy cohesive foil.

This statement has never been publicly controverted, and though at the time the paper was presented, I felt confident in my own mind that its conclusions on this point could not be true, yet I was not prepared to refute the statements by any experimental demonstration. I felt too, that the experiments he detailed were not fairly made, though intended to be so by their author. It seemed to me impossible for the fairest results to be arrived at where all the experiments were performed by the same person, who did not profess to be an expert in the use of heavy foil, while he was in the use of the light numbers of soft foil. Believing that these experiments could not be verified, I borrowed from Dr. Abbott his instrument and instituted some experiments myself, in as fair a manner as it seemed to me possible to do, hoping to secure a scientific demonstration of the point. To this end I addressed the following note to Dr. W. W. Allport, of Chicago, whose capability of packing well as great a quantity of soft gold into a given cavity as any person in the profession, probably no one will be disposed to question:

550 MICHIGAN AVENUE,
Chicago, July 25th, 1874.

Dr. W. W. ALLPORT:

My dear Doctor: I am desirous of demonstrating, by the fairest attain-

able experiments, the relative weight of different plugs of heavy and light gold in a given cavity. For this purpose I desire to have you fill the cavity indicated in the steel plate, once in the old fashioned method formerly practiced by yourself, with soft unannealed gold, and once in the method which you are now practicing.

If you will do this and weigh each plug accurately, and indicate to me in your reply what methods you employed, or any peculiarity connected with either experiment I shall be greatly obliged to you.

I desired to have you make these two experiments, as thereby I shall be assured that I have the highest standard of comparison possible to be attained in this or any other country.

Very truly yours,

GEO. H. CUSHING.

To which I received the following reply:

CHICAGO, August 3rd, 1874.

My dear Doctor: On my return home this morning, I found your note of July 25th.

I have filled the cavity marked on the steel plate, as requested. I will forward the fillings to you at Detroit, this evening.

The filling marked "A", is filled from Abbey's No. 4 soft foil, annealed over a spirit lamp, as used, and packed with mallet pressure; there being a slight covering of cohesive foil, on the surface. In packing this filling, I directed my assistant to mallet in her usual way; but as the plate rested upon an unyielding surface, I have little doubt, that the filling is a little more dense than the same blows would have made it had the operation been made in a tooth in the mouth.

The filling marked "B", is made trom the same foil, unannealed; there being a slight covering of cohesive foil on the surface, packed with hand pressure. It is in every way an "old fashioned" or an "*old fogy*" filling, such as I used to put in twelve and fifteen years ago.

As you will probably have other fillings to weigh, I leave these to be weighed at the same time, and upon the same scales as you weigh the others, so that their comparative weight, may be more accurately ascertained.

In conclusion, allow me to say, that, whilst these experiments may give you the accurate relative weight of plugs made from different preparations of foil, the ascertained fact, in my judgment, has less practical significance in arriving at a just conclusion, as to the most suitable preparation of gold for filling teeth, than dentists are in the habit of thinking. It is not so much the *amount* of gold, packed in a given cavity that saves the tooth from decay, as it is the accuracy with which the filling fits the walls of the cavity. In fact almost any dentist of reputable skill, can pack enough in weight, of any kind of gold, in a tooth, to preserve it from decay, *provided*, that *that* gold is accurately packed against the walls of the cavity.

If therefore, dentists will in the future, be earnest in demonstrating the kind of gold, that can, with the *average skill of the profession, be most accurately and securely packed against the walls of the cavity of decay*, rather than in determining the relative weight of different plugs, made from different foils, we shall in a few years see fewer hard and beautifully polished fillings with blue or blackened teeth around them, than we do at the present time, a result which would be reached by a more general use of a semi-cohesive or soft foil similar to that made by Abbey, rather than by the using of so much highly cohesive foil as is used at the present day.

I can only wonder, that a practitioner, of as much experience and good judgment as Dr. Abbott, could have attached the importance to his experiments that he seems to have done.

Yours truly,

W. W. ALLPORT.

To Dr. Geo. H. Cushing.

The plugs made by Dr. Allport weighed respectively:

A.—17½ grains.

B.—17½ grains.

Those made by myself in the same cavity in the steel plate, weighed:

No. 1—of Ashmead's No. 3 cohesive, using very small pellets and annealing each as used, and using a very fine pointed plugger, 15½ grains.

No. 2—of Williams' rolled gold No. 120, annealing as used, and using a larger pointed plugger, 19½ grains.

I submit these experiments chiefly because I do not wish to have go out from this Association the records of experiments which would lead to erroneous conclusions.

There is no especial importance attending these results, except as establishing the truth regarding a matter of philosophy which a member of this Association had unwittingly placed before the world in a false light.

I do not here propose to discuss the relative merits of heavy and light gold, for though for myself I prefer as a general rule the heavier cohesive gold, and believe that in skillful hands it produces on the whole better results than the lighter soft gold, yet I agree to a considerable extent with the views expressed by Dr. Allport; that is, that the quantity of gold packed into a cavity is not of so much importance as that it

should be properly packed against the walls and margins, nor does it so much matter whether it be light or heavy, soft or cohesive so that it is placed where it is needed, in the most skillful manner.

REPORT OF THE COMMITTEE ON DENTAL ETIOLOGY.

By J. H. McQUILLEN, Chairman.

IN presenting a report under this head, I would direct attention to the fact that in viewing the pathological conditions presented by the dental organs, we must not forget that they are integral parts of the organism and governed by the same laws that control diseased action in other portions of the economy; in other words, that the causes of disease in the teeth as elsewhere are divisable into *predisposing* and *exciting causes*. The *predisposing* cause being in the teeth, defective structure of the enamel or dentine, due to hereditary transmission, (as in the so called syphilitic teeth,) or the prevalence of certain constitutional diseases during the formative period, or defective nutrition in maturer years.

The *exciting* causes are those external influences, such as the action of acids, variations of temperature, mechanical violence, etc.

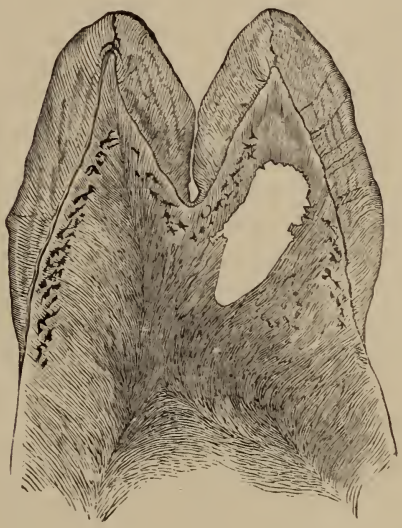
As in other organs the predisposing cause of disease may remain dormant for years, or even an entire lifetime, if the exciting causes are not brought to bear with sufficient force upon them; so the same thing is true of the teeth. Classified as the teeth are with the skeleton by the anatomist, and in chemical composition more analogous to the bones than other tissues, it would be reasonable to infer that in diseased conditions of the osseous system, that the teeth would be very naturally affected by such conditions. And this we find to be the case. In con-

firmation of this I propose to invite your attention briefly to these relations as manifested in the diseases known as Rachitis or Rickets, Osteoporosis and Mollitis Ossium.

Rachitis or Rickets is a disease of early infancy, characterized by a deficiency of the inorganic and organic elements of the bone; the carbonates and phosphates of lime, and the *Osteine* are alike insufficient in quantity and defective in quality. In some instances it is an intra-uterine malady but most frequently does not make itself manifest until the eighteenth or twentieth month of infancy. Both sexes are liable to it. Of the *causes* inducing this affection, some cases seem to be hereditary, several members of a family being attacked; its origin has also been attributed to strumous, syphilitic, or scorbutic conditions of the system, and residence in low, damp, ill-ventilated places; the most prolific and unquestionable cause, however, is the use of unwholesome food or imperfect alimentation, inducing an impoverished state of the blood and defective nutrition. The affection may be confined to certain bones or extend to the entire skeleton. It is attended by excessive softening of the osseous structure, so that it yields to the slightest pressure, and the bones can be bent and twisted in various directions, and often occasioning serious and irremediable deformity.

The teeth of patients who in early life have been affected with Rickets are generally found defective in structure; the enamel generally presents a roughened and pitted appearance. On making a microscopical section of such teeth, (which I have frequently done, and now have an opportunity of showing you one of the specimens under the microscope on the table,) fissures will be observed in the enamel reaching almost to the dentine, whilst the dentine in immediate proximity to the enamel presents that defect of structure known as the inter-globular spaces. So prevalent is this latter condition, that in every tooth I have examined under the microscope from a rickety patient, they have been quite numerous. In a communication entitled "*Microscopical Fissures in the Masticating Surfaces of Molars and Bicuspids*" published in the *Dental Cosmos* Vol. 13, page 300, 1871, and subsequently republished in the *Monthly Microscopical Journal of London*, Vol. 6, page 182, 1871, I directed attention to the fact that the minute openings or fissures found in the grind-

ing, proximal, buccal, palatine and lingual surfaces of molars and bicuspids, frequently lead to cavities of some size. In confirmation of this I gave a description of a microscopical preparation which my friend Dr. R. W. Varney, of New York had placed in my hands; of which I present the following extract from the article named:



"In the accompanying illustration, (of a longitudinal section of an inferior pre-molar, as seen under an 8-10 objective and No. 1 eye-piece, magnifying sixty diamaters,) it will be observed that a minute fissure, invisible to the naked eye in the section, extends from the bottom of the sulcus on the grinding surface of the tooth, through the enamel, almost to the dentine, and enlarging at the lower part into an oval cavity. This is entirely the result of defective formation, the enamel prisms having failed to coalesce at that point, and thus a condition is presented favorable to the retention of fluids and semi-solids, which undergoing decomposition would speedily destroy the thin septum of enamel covering the dentine. In the latter tissue, closely contiguous to the enamel, a number of black spaces (the *inter-globular spaces*) will be seen. Here again is located defective structure, and a prolific predisposing cause of decay."

"As evidence of the practical bearings of these investigations, it may be well to direct attention to the fact that the existence of these spaces in teeth which have completed their growth must be regarded as an *abnormal condition*, predisposing such teeth to decay, and that when either by mechanical action, as by a fall or blow, or by the penetration of external caries, such spaces are reached, the *disease here would run riot;* hence the importance of care on the part of patients and operators to have the most minute cavities filled, for though reached only through a microscopical opening, the result would be the same, while if protected from the action of external influences, or the *exciting cause of decay*, this predisposition might remain dormant for a lifetime as is some times the case with other diseases."

Osteoporosis in contradistinction to Rickets is an affection of the bones produced by dilatation of the Haversian canals, lacunæ and canaliculi, and sometimes attended with softening of the tissue of the bone; whilst in Rickets there is a deficiency of the mineral constituents of the bone and of the osteine. According to Rokitansky: "This state may result from excessive development of the medulla of the bone, or of the tissues which occupy its canals and cells; while, at the same time, the actual quantity of bony substance remains unaltered. By a rarefication of its tissue of this kind the bone becomes increased in volume—expanded. The walls of the enlarging cavities become thinner and thinner, till at length, apertures are formed in the interior of the bone, as well as in its outermost lamella, and the cavities communicate with one another. The expanded bone is soft, coarsely porous, and spongy; and more or less so in proportion to the degree of the disease; it yields to the pressure of the finger, and may be easily cut with a knife."* The affection is most frequently observed in the bones of the skull and may occur at any period of life, but is most frequent in childhood and old age. Among the recognized causes of Osteoporosis are Syphilis, Scrofula and Rheumatism. I have had only one opportunity of examining a case of Osteoporosis. My friend Dr. Wm. Pepper having

---

* Rokintansky's Pathological Anatomy, Vol. 3, Page 138.—Philadelphia, Blanchard & Lea, 1855.

brought to me a phalange of the finger of a boy, age fourteen, a native of England, who died February 8th, 1868, after a painful illness. His face, arms, and limbs had become very much enlarged and exceedingly painful prior to death. The true nature of the affection was not recognized until after his decease. After making a microscopical section of the bone, I requested Dr. Pepper to supply me with one of the teeth for microscopical examination, stating at the same time that I had reason to believe that the *inter-globular spaces* would be found quite abundant in the dentine. Having complied with my request by giving me a canine tooth, I found on making a section of it confirmation of the opinion I had expressed; the inter-globular spaces being scattered throughout the coronal dentine. Whether this would be found to prevail generally in the teeth of persons affected with this disease remains to be determined by subsequent investigations. It is not only an interesting but also an important point to determine, as it has a practical bearing upon the durability of the teeth, as some cases of Osteoporosis are curable; it being succeeded by induration of the affected structure.

Mollities ossium or Osteo malacia is quite a different affection from either of these named and attacks persons who have reached adult or advanced life. It is a rare but most destructive and dangerous disease of the bones, characterized by softening of the osseous tissue, dependant upon the gradual removal of the earthy constituents and the deposition of a reddish sero-albuminous, oily or greasy substance. According to the authority already quoted*: "The bones diminish in size and their texture is rarified and atrophied; they become saturated with fat, and reduced to their cartilaginous element. In this condition their corpuscles are empty and when viewed by transmitted light, diaphanous; there are no canaliculi (Kalk-Kanälchen) and the lamellar structure is lost. The bone at the same time undergoes a striking change in chemical composition, the extract produced by boiling being not only different from chondrin, but also from the animal matter of bone."

---

*Rokintansky's Pathological Anatomy, Vol. 3, Page 142.—Philadelphia, Blanchard & Lea, 1855.

The cause of this complaint seems to be involved in obscurity; in some cases it appears to be connected with a Rheumatic tendency. It is more frequent in the female than in the male sex, and sometimes makes its appearance after child-bed. The affection may be confined to certain bones, or extend to the entire skeleton as in the case of Madam Supoit, whose bones had become so completely softened that her limbs could be placed in almost any position. The lower extremities for instance could be bent so that the toes touched the back part of the head, while her arms could be thrown into equally distorted positions. She had lost all control over them, and was unable to move any part of the body with the exception of the head and left arm. The disease frequently begins during pregnancy or within a short time after parturition. It is said to be in some cases hereditary, presenting itself in three successive generations, but not prior to puberty. Of all the affections which we have considered, this one is the most interesting to us on account of the fact that the teeth are coincidently and seriously affected; thus it is not an unusual thing to find young women whose teeth prior to marriage were remarkable for their beauty and apparent perfection of the enamel and dentine and which under the excavator and drill, when demanding attention, had been found hard and exceedingly difficult to cut with a keen instrument; after bearing one or more children these teeth undergo the most remarkable change; decay making its appearance in various directions and the tissues cutting under the instrument with facility and as if composed of gelatin; and the decay not unfrequently progresses with such rapidity that one or more teeth are lost after each pregnancy, thus confirming the old adage: "For every child a tooth is lost." Are we not justified in attributing the softening of the bones in Osteo malacia and the remarkable softening of the teeth, to the fact that during the period of pregnancy the demands of the fœtus in utero for the calcareous constituents in the food taken by the mother to build up the osseous structure are so imperative and exacting that the mother is robbed of those constituents so essential to repair the interstitial changes taking place in her bones and teeth? And is it not also reasonable to infer in the cases that come under our observation where the teeth are so remarkably affected or changed during the period of pregnancy, that

the osseous structure has suffered at the same time, but not in a sufficient degree to attract the attention of the general practitioner? I have never made a microscopical examination of the teeth of a person affected by Mollitis Ossium, but believe that it offers an interesting field for investigation.

ADDITIONAL REPORT
ON
DENTAL ETIOLOGY.

By MARSHALL H. WEBB, a Member of the Committee.

ETIOLOGY—From, αἰτία cause, and λόγος, discourse or description—the science of causes; that department of philosophy, or of science, which treats of the causes of phenomena.

The words of our title are intended to embrace the causes of all those processes destructive to the dental tissues following the periods of their formation, development and solidification.

During the embryotic period of the tissues, whilst the formative process is going on, there may be deficient dental nutrition, or, during development, there may be an interruption of such nutrition, caused by some general affection such as measles or scarlatina, so that when the teeth are solidified and erupted there may not only be insufficient density to withstand the attack of destructive agents, but also permanent defects.

Then, too, not only are temperaments, diatheses, and idiosyncracies inherited, but the teeth, also, oftimes bear the impress of special affections through hereditary influences.

Investigations, in this department of our specialty, are principally directed to the etiology of the phenomena of decalcification, softening and destruction of the dental tissues. Such phenomena therefore, will be considered under the title of Etiology of Dental Caries.

Original imperfection of tooth-structure, especially where the teeth are in contact so as to favor lodgment for foreign substances; insufficiency of calcareous constituents in the central portion of

the enamel prisms, and an unusual number of inter globular spaces throughout the dentine; incomplete coalescence of the prisms at the sulci and fissures of bicuspids and molars, so that particles of food may be impacted into these interstices during mastication—all such conditions establish a proximate cause of caries, so that when these substances are converted into an acid product, the teeth are soon involved in disintegration. Certain conditions of the oral cavity may favor the formation of acids as well as the parasitic plant—the leptothrix buccalis—which is regarded by Lieber and Rottenstein as having very much to do with the progress of dental caries. Wedl, though not enunciating the same views, yet recognizes that disintegration of the dentinal structure is, in some instances at least, accelerated by the presence of leptothrix masses and acknowledges that in nearly all cases of soft caries, fungi are present. Hallier is of the opinion that leptothrix is a form of development of the fungus pencillium glaucum.

Lieber and Rottenstein succeeded in obtaining, from experiments upon natural teeth by means of dilute acids, results identical with those of Westcott, Allport, Mantegazza and Magitot. Caries of the teeth, however, has not been successfully imitated; yet acids are said to produce upon the enamel, phenomena which are also observed in decay of this tissue.

Lactic acid has been found to be most abundant in the mouth, though acetic, tartaric, butyric, oxalic and citric acids also act upon the teeth. It has not been found necessary that acid solutions be strong, to separate the carbonic, or even the phosphoric acid from the lime with which they are combined.

Enamel, in its normal state, is translucent; dentine is of an opaque-whitish or yellowish shade. Enamel, when attacked by acids, loses its translucency, whilst carious dentine becomes translucent, and almost cartilaginous, owing to its loss of inorganic elements. Previous to dissolution, no special change in the elements of enamel has been observed except that it is easier to recognize, in enamel undergoing decalcification, the structure of this tissue, than in normal fragments, when the union of the prisms cannot be so distinctly seen. This phenomenon is due to a loss of calcareous constituents.

Soon after the dissolution of the enamel, the leptothrix buccalis has been observed to have penetrated deeply into the clefts and

interstices of decalcified dentine and to have extended its influence through the tubuli toward the pulp. Since microscopical investigations have been made in this department of science, observations have taught that the tubuli adjacent to disintegrated dentine become enlarged, and that, too, in cases where, through unaided vision, the dentine would have been pronounced normal and caries be considered only superficial. Lieber and Rottenstein attribute this enlargment of the tubuli to granulations of leptothrix. They discovered that there is formed at the surface of enamel unexposed to friction and uncleansed, a bed of leptothrix. They, also, consider as probable that the leptothrix penetrates the dental cuticle, if still existing, and destroys it.

Destruction of the teeth of children is often due to a green fungus called the protococus dentales, a vegetable parasite, which acts upon the labial surfaces.

In view of the discoveries made in relation to the etiology of dental caries, it seems reasonable to infer that acids and elements of leptothrix penetrate the fissures opened in the enamel and further disintegration ensues, and, upon reaching the dentine, the destructive process goes on with accelerated rapidity. By the almost constant proliferation of leptothrix the decalcified dentine becomes decomposed into irregular parts, which, near the surface, are separated into yet smaller parts, and the destruction of tissue is thus finally completed. In consideration of all this, it would appear that if caries be superficial, the remaining tooth-structure can be saved by the removal of such decay, but if the dentine be involved, none but magnified perceptive power can ascertain whether elements of leptothrix remain in the tubuli or not, even when all decomposed matter is supposed to have been removed and the surface polished. If the walls of the tubuli be distended, and elements of leptothrix remain, then caries will, very probably, again ensue, especially if there be an acid condition present, which acid, besides doing its work of decalcification, also favors the proliferation of leptothrix—it having been observed by Lieber and Rottenstein that this parasite flourishes most luxuriantly in acid solutions. This recurrence of caries will not take place if a portion of disintegrated dentine remains at the bottom of deep cavities, for when all save this has been removed, and the cavity of decay is filled with a suitable material, so as to

exclude air and moisture, such fungi perish, or the destruction of the leptothrix may be previously accomplished by an application of carbolic acid. When dentine is attacked it is best to remove the carious portion, excepting that which may directly cover a nearly exposed pulp, and fill the cavity with gold, or whatever substance indicated, rather than cut away tooth-structure sufficiently to literate the caries.

Under favorable circumstances calcareous deposits appear to first fill the tubuli, commencing at the exposed portion of dentine and sometimes resulting in a formation known as secondary dentine, upon the interior surface of the pulp chamber. Magitot believes that these deposits spring from the pulp and that such deposition is induced by slight irritation of this tissue. Lieber and Rottenstein regard as proven that the deposit upon the interior surface of the pulp chamber cannot be identified with that which fills the tubuli, yet also consider that these formations, as well as normal dentine, take their origin from the dentinal cells of pulp. They also observed that the masses of leptothrix contained in the dilated tubuli are sometimes impregnated with calcareous salts, but that these deposits are most commonly met with in the undilated canaliculi of deep layers of dentine changed by caries. These calcareous granulations have also been observed in the inter globular spaces. When dentine is exposed through the removal of supposed superficial caries, or otherwise, and before calcareous matter can be deposited, decalcification may continue, the elements of leptothrix proliferate, and caries again be the result. Mr. John Tomes, whilst regarding the phenomena of the deposition of calcareous elements as brought about by vital action, yet considers it more than probable that the dentine, thus consolidated, loses its vitality. This loss of vitality in dentine, when consolidated, is evidenced by the part being non-responsive to the touch of a metallic instrument. When, therefore, the enamel is decalcified, the dentine involved in the carious process and the remaining tissue underlying this, is transformed into non-vital substance by such calcification, then the same agent which acted upon the tooth's almost mineral dome, will the more readily act upon this. Part by part is thus destroyed, notwithstanding nature has, from time to time, erected barriers, in the

form of such consolidation, for the protection of the pulp and as a means of saving the remaining dentine.

We frequently see exposed surfaces of roots polished, and caries thus prevented, but this seems to be brought about by the action of an antagonizing tooth, or the mastication of food between two such. Since no vital action can take place in non-vital tissue, this phenomenon appears to be due to such mechanical process, causing the impaction of particles of the dentine, upon the exposed surface, into the tubuli; or, indeed, this mechanical action may compress the tubuli, which occupy at the necks of the teeth, a nearly horizontal position.

Salivary calculus, accumulating about the necks of the teeth causes irritation of the surrounding parts, and, insinuating itself beneath the margin of the gums produces absorption of the alveolar processes and the consequent loosening and loss of the teeth. The salts contained in the calculi appear to be precipitated in the saliva and then gradually deposited upon parts of the teeth unexposed to friction. Late researches confirm the statement that filaments and granulations of leptothrix, as well as epithelial cells, leucocytes, etc., are embodied in masses of salivary calculi. The leptothrix has been discovered by dissolving away the calcareous portion of these masses by means of dilute acids.

One can frequently observe that in mouths where there has been an excessive deposition of salivary calculi about the teeth, decay has made but little progress, and *vice-versa*. Such conditions are found not only in the mouths of those of middle age, but in the case of the young, whilst the aged often become edentulous from this cause.

The secretions of the submaxillary and sublingual glands are said to be constantly alkaline, whilst that of the parotid may be slightly acid. This acid reaction is thought to arise from the carbonic acid absorbed in the liquid, which holds in solution the carbonate of lime with which the liquid secreted by the parotid gland is abundantly provided. When the acid reaction ceases, the carbonate, as well as the phosphate of lime is precipitated and deposited upon the teeth. The fluids of the mouth may be neutral, or even alkaline, and the precipitation of calcareous matter may not ensue because of a lack of the salts held in

solution by the saliva, or there may be a diminution of the salivary secretion.

When the oral fluids indicate a decided acid reaction, and the carbonate and phosphate of lime, in solution in the saliva, are dissolved instead of being precipitated, it would seem that, with such action upon calcareous ingredients, the acid would have spent its force and have become neutralized; yet decalcification of the enamel and dentine may still ensue, which process aided by the leptothrix which has in such a menstruum its greatest stimulant, soon results in fully pronounced caries.

Unless the progress of caries be arrested by artificial means the work of decalcification goes on; granulations of leptothrix accelerate the destruction of tissue, the membrane which encloses the pulp tissue and lines its chamber is reached, and through almost constant irritation, inflammation ensues and the pulp is destroyed; the whole crown is soon gone, and the thin brittle edges of the deep pulp cavity scarcely rise above the surrounding tissues, reminding one of the crumbling walls of a ruined castle. Irritation, congestion and inflammation of pulp tissue, and, consequently, odontalgia, death of the pulp, and, also, as a subsequent condition, suppuration and development of abscess, with its attendant evils, result from dental caries. Indeed to caries may be traced almost every manifestation of disease connected with the teeth. Necrosis of the maxilla may ensue through chronic abscess; which abscess is caused, almost always, by mephitic gass arising from putrescent pulp tissue and escaping through the apicial foramen; devitalization of the pulp follows inflammation, the result of irritants finding lodgment in a cavity of decay, and all this concomitant with dental caries.

DISCUSSIONS.

Dr. NOEL: I have always regarded Dr. Watt as the dental chemist of this organization, and I expected when he was discussing the action of acids upon the teeth, to hear him make some reference to the agency of lactic and acetic acids, in the production of decay; he passed over it, however, without referring to it, and therefore I would direct your attention for a moment to this point.

It is a well known fact among physiologists, that saliva has the power of converting starch into sugar, and the sugar thus formed, is grape sugar. Cane sugar, is often present in the mouth, being used as food, and as a condiment, and by appropriating the elements of water, which are always present, cane sugar (C_{24} H_{22} O_{22}) may be converted into grape sugar.

This grape sugar composed of C_{24} H_{24} O_{24}, may, by a heat of about 98 or 100°, be split into lactic acid, which is represented by the formula C_{12} H_{12} O_{12}; one molecule of grape sugar, producing two molecules of lactic acid. Grape sugar may be split into either lactic or acetic acids, either of which will attack the lime phosphate of which the teeth are composed. Some difference in temperature, some difference in conditions, not well understood, may determine which acid shall be formed. The reaction may be represented thus:

C_{24} H_{24} O_{24} [grape sugar] = 2 (C_{12} H_{12} O_{12}) [lactic acid.]
Or, C_{24} H_{24} O_{24} [grape sugar] = 6 (C_4 H_4 O_4 [acetic acid.])

I want to give my idea of the action of these acids in the disintegration of the lime phosphate of which the teeth are composed.

This is the tribasic phosphate, and is formulated (3 Ca O) P O_5. By the action of either acetic or lactic acids the tribasic is converted into the bibasic phosphate, leaving the enamel or dentine, as the case may be, in such a condition that it may be washed out.

Thus: 3 (Ca O) P O_5 [tribasic phosphate] –|– C_4 H_4 O_4 [acetic acid] = Ca O. P O_5 . C_4 H_4 O_4 [acetate of lime] –|– (2 Ca O) P O_5 [bibasic phosphate.]

Or, (3 Ca O) P O_5 [tribasic phosphate] –|– C_{12} H_{12} O_{12} [lactic acid] = Ca O. P O_5. C_{12} H_{12} O_{12} [lactate of lime] –|– (2 Ca O) P O_5 [bibasic phosphate.]

As I have before remarked, we may trace the origin of these acids in the mouth, either to sugar directly introduced, or to the mutations which starchy food undergoes, when allowed to remain long between the teeth. Wheat bread, potatoes, beans, and many of the staple articles of diet, furnish the elements from which these destructive acids may arise.

REPORT OF THE COMMITTEE
ON
DENTAL EDUCATION.

By A. F. McLAIN, Chairman.

OF late years, a gradual loss of confidence, amounting almost to positive distrust seems to be gradually taking place in the minds of many of our leading practitioners of dental surgery with reference to the efficacy, or rather, thoroughness of instruction as obtained in dental colleges.

This feeling has apparently grown out of a common belief that graduation in these Institutions has become too *facile*, less however, from the incompetency of their teachers, than from rivalry among themselves, and motives of pecuniary consideration, which they assert, is tending to fill the ranks of the profession with persons wholely deficient in those necessary qualifications which should distinguish the true "dental surgeon."

Viewed dispassionately, the accusation just alluded to against dental colleges, has no foundation in fact, for it is well-known that no body of men has exhibited more disinterested devotion to, or has made more pecuniary and personal sacrifices for the cause of dental education, than the professors of dental colleges. With a few exceptions, all of these teachers, it can be shown, have contributed not only largely of their means in founding and organizing these institutions, but have been laboring zealously session after session in imparting instruction to their classes without present compensation, or even without an ultimate expectation of receiving emoluments however small for the arduous services they are rendering. Mercenary or interested

motives, therefore, cannot indeed, be imputed to them. But, it must be conceded, however, by the unbiassed mind, that dental colleges have in later days failed in a great measure, to meet the expectations of the profession, whose rapid and material advancement in the fields of *art* and *science*, has rendered a higher order of requirements essentially necessary to its members. Therefore, the character, educational attainments, and the proper culture of those who propose to enter within its fold, are of an undoubted, vital interest to the profession, conditions upon which its future status depends. Hence, it naturally looks to dental colleges—the legitimate source and medium of instruction, for that complete and systematic training of their pupils, that would place them on that elevated scale of excellency which is so desirable, and which is in so perfect accord with the progressive spirit of the age.

On close inspection into the workings of dental colleges, it will be perceived that, although they have in nowise deteriorated in the quality, or retrograded in modes of teaching, yet the charge of inefficiency made against them, is not entirely groundless, for they have been remiss, if in nothing else, in failing to elevate the standard of professional education proportionately with the wider scope and greater range which dentistry as a specialty of medicine has taken in the domain of science.

One of the causes of defective dental collegiate education in this country, is attributable to the usual custom which obtains of final examinations being conducted by the professors in person, who by frequent intercourse for one or two seasons with the candidates for honors, expose, as a natural consequence, the weak points of the latter, hence, the examiners' sympathies, become enlisted and, though unconsciously to themselves, they naturally relax in rigidness; which if it does not lead to partiality, at least. tends towards a leniency that is calculated to act detrimentally to a proper grade of qualifications, subversive in itself to a great extent, of the just ends this formality is intended to promote, The leniency referred to, consists in propounding leading questions, and those that the candidate could not fail in answering if at all observant, by having heard them solved previously at the daily or weekly class examinations.

Another serious defect in the teachings of dental colleges, one

which, I think has given the most cause for dissatisfaction, arises from the common usage they practice of graduating students on attending only two sessions; which is tantamount to making dentists of them in eight months of actual methodical studies; for it is a well-known fact, that during the interim between the lecture seasons, little, if any progress is made by them, in consequence of the unsystematic and desultory manner in which they pursue their studies. Under such circumstances, it is therefore utterly impossible, however apt students may be, coming as they so often do, with no previous preparation, to attain any great degree of manipulative skill, or make much proficiency in the scientific departments of dental surgery in so limited a period of active pupilage. In the mechanic's arts, for instance, where executive talents are those mostly cultivated, an apprenticeship of not more than two years, is ordinarily considered inadequate to make a competent workman. Then, how very futile it is, to expect dental students to become masters of a profession which involves the possession of the highest order of manipulative and artistic skill, besides an intimate acquaintance with several abstruse scientific subjects, in which a life-time study could not give perfection. Now, taking into consideration, the totally unprepared condition already alluded to, in which the average number of students present themselves at colleges for the first time, manifesting a perfect ignorance of even the elementary principles of practice, or forming no adequate conception of the range of studies appertaining thereto, nor to what extent they should be carried, the wonder is, that any of those short term graduates, so to speak, ever attain more than mere mediocrity in the practice of the profession. This complete lack of preliminary education on the part of dental students generally, has prevented dental colleges from adopting a higher curriculum, and thus forced them to continue to pursue merely rudimentary courses of instruction.

It has been thought that statutory enactments would cure the evil, but they are insufficient to impart to colleges that enlarged sphere of usefulness and efficiency which are expected of them, and for the want of which they are encountering so much opposition. Laws regulating the practice of dentistry would do this, however. They would prove salutary in elevating the

status of dental surgery as a profession, by shutting out from its ranks, those grosser and more reprehensible elements—charlatanism and ignorance. It should not be forgotten, however, by those who are criticising these institutions, that the very elevated position enjoyed to-day by dentistry as a profession, has been the outgrowth of the educational efforts of dental colleges, with the co-operation of dental associations.

Now, what is needed to make these institutions all that is desired, and to give a character of worth to their diplomas, is for the members of the profession to furnish them with better materials than they have done heretofore; and for the accomplishment of which object, they should not accept as private pupils any but those who posses a good primary education, and are fitted by nature for the vocation, then at the same time obligating them to pursue not less than three years of private instruction and then to pass regularly through some reputable dental college, whether its curriculum requires an attendance of three or five terms in order to obtain its honors.

But dental colleges, on the other hand should adopt the plan employed by English medical schools, of confiding the examinations for degrees, to competent boards—outside of their respective Faculties, so that the possibility of diplomas being awarded to candidates otherwise than for real merit could not arise, or give occasion for suspicion that degrees have been conferred through motives of kindness or from favoritism.

Furthermore, nothing would tend more toward elevating the standard of professional education than for colleges to lengthen their courses to five or even six months duration, besides making an attendance upon them of from three to five sessions a *sine qua non* for graduation.

The adoption of reformatory measures for improving and keeping up the standard of dental education is no less a duty which dental colleges owe the profession, than it is a matter of self preservation. For, at the rate they are now manufacturing an inferior grade of dentists, with many exceptions be it said, the profession at no distant day, is destined to become *overrun*, and thus prove destructive to its remunerative prospects, while the reproach brought upon themselves would result pecunarily to their own material injury.

Though the first of the colleges that would take the initiative step in the course just indicated, might, in the beginning sustain a diminution in patronage from certain quarters, yet, the fees resulting from an attendance upon an increased number of sessions would more than compensate them for this loss—besides gaining the moral, as well as the physical support of all dentists interested in dental education, from witnessing the marked superiority in point of ability which their graduates would present. At all events, when the example is once set, no doubt, all dental colleges will follow in the adoption of rules and regulations of a similar character.

ADDITIONAL REPORT

ON

DENTAL EDUCATION.

By G. W. KEELY, a Member of the Committee.

THE branch of dental surgery is certainly a legitimate specialty of medicine. It should assume its true functions in the healing art, and its relation to the medical profession in general. Its practical processes should be controlled by the principles of medical science. Granting this, the basal elements of dental practice will be found in a thorough study of the whole physical organism.

A satisfactory acquaintance with these ground truths, should hereafter be required of every student of dental science, as the first step to bring our specialty into its normal relations to the general system from which it is a legitimate offshoot. The time has gone by when a mere mechanical skill, with a few general ideas, picked up in desultory miscellaneous reading, can be regarded as a preparation for the serious and delicate responsibilities of the dental practitioner.

He is a member of a learned profession, to whom the community look up with increasing respect, in proportion as those qualities develop. Knowledge, which is power in every other branch of human activity, is no less such in that branch of the healing art, which takes cognizance of one of the most important functions of the human economy.

The coldness of the general medical practitioner, has hitherto been a barrier to that intimate association, which should exist between the two professions. This has been remarked by den-

tists from abroad, who, not comprehending the true state of things, are apt to lay the blame upon the dentist; whereas, the fault lies with the other party. It is not to be supposed however, that this seeming prejudice, can forever resist the influences of reason, and common sense. Let the dental practitioner demonstrate his worthiness of professional companionship, by thoroughly grounding himself in the fundamental principles of medical science, and apply them to his chosen specialty by legitimate, logical, and practical processes; let him manifest a commanding professional skill, a thorough culture, and general manhood, and he will find the narrow spirit of professional bigotry, which refuses to recognize the scientific brotherhood of this special branch of medicine, gradually narrowing itself out of existence. Dental education must then be extended to embrace all the basal elements of medical science. A thorough indoctrination in these, demands a preliminary broad literary culture. The mind must be versed in the general rudiments, and trained in all the methods of logical thought which develop the understanding. The sensibilities of the heart and monitions of the conscience, no less need the genial impulses of æsthetic and moral culture. Dental practice and science, need a fully developed and highly intelligent manhood as its basis. The college diploma is too often a fraud upon the community, but one so transparent as to work little injury save with the ignorant. The literary and scientific training truly represented by that diploma, is the least that the professional man should be satisfied with, as the basis of his professional education. The elements of general medical science might be acquired by the candidate for dental practice, in the medical college proper, provided there was a harmonious co-working of the two professions in education. In the absence of this mutual understanding however, it may be thought best by those who bear the responsibilities of dental education, to provide adequate facilities for instructions in general medical science in the dental college. It is of less importance *where* the work is done than that it be well done. Whether the medical college should organize a special faculty in dental science and make its curriculum of studies conform to the necessities of students devoting themselves to the special practice, or, whether the dental college should secure the services of skilled medical professors,

to teach the fundamental elements, is a question which may be better answered after an adequate experience.

At present, there is ample room for dogmatism in the absence of facts. What is here insisted on, is, that this preparation should be honestly and thoroughly made. Having *these* elements learned, the student is prepared to take up the study of the special branches of science pertaining to his calling, from a more commanding position, and with a far more intelligent appreciation of their significance and value. His mind is already trained to habits of investigation, and hence he will not spend the time required by imperfectly educated minds, in order to assume the proper role of study. An immense mass of preliminary principles, will be incorporated with his understanding, and leave him a great amount of time for the higher elements of his profession, which the imperfectly educated man must apply to laborious study of the rudiments. Perhaps in thus broadening the scope of preparation for the practice of dentistry, we may cause impatient aspirants to turn away in disgust, and resolve that they will ignore all such requirements, and rush to seize the emoluments of the profession by some shorter road.

Let such remember that the time for this has passed by; success in any scientific calling demands a far more elaborate preparation, than in the last generation.

The leaders in dental practice, many of whom acquired their professional learning without the facilities enjoyed by the young men of this day, are the foremost in recognizing the necessity of this broad and noble culture.

The requirements of the practice are daily calling for a more advanced and scientific intelligence, and they who minister to these demands must have laid up in their mental organization, the natural and required abilities to grapple with the ever increasing responsibilities. A young man who rashly assumes professional responsibilities, without thorough and honest preparation, is not only condemning *himself* to a very meagre share of the benefits of his calling, but is criminally exposing his unhappy patients to the sinister consequences of his blundering ignorance. The student of dentistry should place himself and his studies under the direction of some competent preceptor, one of recognized skill and respectability, who is sufficiently alive to

the responsibilities of his position, and of the ever widening demand of dental science—who will require from three to five years of preparatory study. A sensible and honest preceptor, will first take the measure of his pupil, physically, intellectually, and morally. If he is found deficient in any required element of success, he should plainly unfold it. He should explain the necessity of thorough preparation for the duties of his proposed calling, and give him the broadest possible views of professional duty and the arduous demands which it will certainly make upon his energies and time. He will moderate his impatience to assume those responsibilities, and keep his mind fixed upon the grand goal of eminent success, to be won only by persevering effort. In directing his preparatory studies he will recognize the necessity of the best instruction in the general principles of medical science. He should not fail to point out the vast numbers of illy educated young men, which the rival medical schools of our country are annually sending forth to prey upon the distresses of the community. He will especially deprecate the same foolish and suicidal policy in the establishment of dental colleges.

The more intelligent men of the medical profession are becoming alarmed at the annual copious discharge from their schools, and know that this affluence of numbers, can be secured only at a large sacrifice of qualifications; they understand what inducments moral and local interests are prone to offer young men, which do not lie in the direction of hard study, and thorough preparation, but rather in the neglect of them. In order to swell the number of graduates, the standard of attainments must be lowered, which cannot be done without serious injury to the character of the profession.

The present time admits of less blundering in this direction, than any time of past history, as the demand for high and thorough qualifications for medical practice, is more pressing than ever. There are doubtless medical schools in the country, which do not *yield* to this demoralizing temptation, and which require as an inexorable condition to graduation, a thorough mastering of the elements of medical science, as shown by a severe and exhaustive examination. The diplomas of such colleges stand high, because they represent a definite amount of thorough preparation and training. To such a school, the prudent dental practitioner, will

direct his pupil if necessary, to receive his preliminary medical education, and insure the greatest amount of mental discipline.

The time is not far distant, when the dental colleges will be compelled to provide this preliminary instruction. To accomplish this greatly desired result, it will be well if the crying error of the medical profession be avoided. Instead of attempting to establish dental colleges in every great city, it would be the only wise and true policy, to concentrate efforts at a few leading points.

The number of practitioners of our specialty, must remain relatively small, in comparison to the medical profession, and hence it is folly to set up a grand array of colleges. Three or four will be ample provision for our whole country. Say one east, one west, and one south; and when the time arrives let one be established on the Pacific coast. For this number of dental colleges, it would be comparatively an easy work to secure a permanent endowment, by each section concentrating their efforts and means, and with a curriculum of studies embracing both dental and medical science.

The professors of the colleges already established, are very poorly paid for their services, and are compelled to eke out their subsistence, by active professional labor. This necessity must to some extent, impair the value of the instruction imparted. Each chair in a dental faculty, is sufficient to tax fully the energies of a first-class mind. The investigation of new points, the co-ordination of principles, and their adaptation to instruction, demand the undivided attention of the professor. His pupils may not at the time be able to detect any shortcomings in his labors, but in after years they may become conscious of deficiencies which they will be compelled to make good by severe extra labor, amid the toils of professional duties. This starveling policy will be found in the end to involve an enormous waste of time, effort, and money.

It is a notorious fact that not a single professor in any of our dental schools holds his position except at a pecuniary sacrifice. This is neither just, nor right, and no such unnecessary sacrifice should be required of men in the performance of public duty Our profession owes to all such, a lasting debt of gratitude. I am aware that this policy of concentration, will ignore powerful

local interests, and may provoke sharp recrimination. This, however, is one of the conditions of success in any great movement. The truth is ascertained only after discussion and even sharp altercation. But here we must not forget the amenities of gentlemanly and professional courtesy. When we are brought to recognize the necessity of concentration upon a few dental schools, we must resolutely hold to that policy, in spite of the clamor which may be raised by interested parties.

The absolute necessity of this concentration, is obvious to those best acquainted with the condition of our schools. By limiting the number, and concentrating our resources upon their endowment, it will be perfectly practicable to secure to each professor a competent salary. But, if we see proper to follow the foolish example of our literary and medical educators, and divide up our means in a great number of starveling projects, we will inflict upon dental education the disastrous evils which they are now deploring. We sincerely hope that the real state of the case may be seen before we become helplessly involved in the ruinous policy of dissension and division.

DISCUSSIONS.

Dr. JOHN ALLEN: Dental education embraces much more than a casual observer, upon a superficial observation, would suppose. It has been well said that every man has two educations, one which he derives from others, and one which he gives to himself. We have had elaborate remarks in these papers upon the degree of education that is to be derived from others. The few remarks I have to make now will be confined to the latter. It has been said of our dental colleges that they have not discharged their duties, that graduates have gone out from these institutions who have not met the requirements of their patients, and discredit has reflected back upon the institution from which they graduated. This is wrong and it is for want of this second education that this thing is met with.

In our institutions the pupils are expected to go as far as the books and their instructors lead them. It is too often the case that the students after graduating, will settle down into mediocrity and suppose because they bear with them a diploma, that is as far as they can go.

It is self-education that enables men to go beyond where others have gone, without which there will be no progress. After having exhausted what can be learned from books and teachers let the mind of the student then be turned upon itself, and it may be able to bring out hidden treasures that were never before revealed to men.

A celebrated painter remarked that when he wished to produce the desired results he mixed brains with his colors. It is a very important matter, especially in our profession that we mix brains with our work.

While concentrating our efforts to elevate our profession, in advancing the most important branch of it—the preservation of teeth, the artificial branch has been unfortunately neglected, and when I made the remark yesterday that that branch was lower

to-day than it was 30 years ago, I meant just what I said; but as a whole our profession stands higher than it ever did before.

Dr. WALKER: I hold that the dental profession occupies no mean position and am glad that this paper has so clearly stated my views upon some points of this topic. But I hope that our dental colleges will go a little further than any of them have been going. The man that merely confines his attention to mechanical manipulation of teeth does not go to the full extent of what a dental education should include. When we see so many of our best men in the profession breaking down, having to spend months after months away from their offices to recuperate, we see the lack of knowledge they ought to possess, the lack of appreciation of that whole education which should demand a knowledge of the system beyond the mouth.

Dr. TAFT: There are many obstacles that lie in the way of effecting a thorough dental education. One rests with the profession, those who assume to be private tutors. There ought to be great care exercised by every one who attempts the instruction of students. Care should be exercised in the selection of those who are encouraged to enter upon a course of preparation for dental practice. This care should have reference to the inherent ability of the student, his ability to study, and to his preliminary education. He should have a good literary and general scientific education, which should embrace, as has been stated in both the papers read, a thorough knowledge of all the fundamental principles and subjects pertaining to medicine and surgery.

I know that many have said it is better to go into the colleges at once, where there would be systematic training better than can be obtained in any private office. There are other things to be accomplished besides the mere instruction in the profession. A student comes in with almost an entire absence of a just appreciation of what he is about to do. Stimulate him, educate him to understand what he has before him and what will be required of him. Do not tell him that with a year or two of private pupilage and two courses in a college he can be as well fitted to practice dentistry as anybody, as is too frequently done. Give him to understand that it requires a thorough course of training.

The Mississippi Valley Dental Association years ago, when the standard was very much lower than now, resolved that its

members would not receive students for less than two years at the least. More recently the Michigan State Association passed a resolution that its members should not receive a student unless he took a pupilage of three years and at least two courses in a dental college, and I must say that from the State of Michigan we receive students as well prepared as from any other section of the country, if not better.

I have watched this thing closely and have observed where our best students come from. They come from the offices of men who give them a thorough training. One gentleman who read a paper this morning will not accept a student in his office short of three or four or five years, and when he gets them there he gives them a thorough training and drilling, and when his students enter the college they go prepared about as well as many students are when they pass out from the colleges.

The local societies are taking up the matter of dental education. The State societies are taking it up. That is all very proper, but it seems to me that a presentment should be made from this body in respect to this matter. This is a representative body and it cannot afford, for its own reputation, to let the local societies go in advance and lead it. We should make a pronouncement upon this subject that should be clear and unmistakable. A thorough consideration of the subject should be had here, and it should be carried down to the local societies, and if they all come up to the highest level that this body will take, uniformity can be maintained.

Let this body make a clear and unmistakable pronouncement upon this subject, one that cannot be mistaken by our educational institutions throughout the country, and no college in the country, I think, would ignore it.

Dr. Thomas: You will all agree with me that the longer we are in the profession the less we desire to have students in our offices, but there are those that have such a strong attachment for pecuniary interest that students that have no business there, are continually admitted to offices; and I believe, as Prof. Taft remarked, that this association ought to take the initiatory step to lay out the ground work as to how young men shall come into this profession. I believe it is one of the cruelest things that a dentist can do to advise a young man that he can become a

dentist in less than seven years of study. I believe the time will come, and I hope to live to see it, when a dentist going out of a dental college will be just as well fitted to practice medicine as dentistry, because I believe dentistry is but a specialty of medicine.

My opinion is that no dentist should admit a student to his office at all. He should go directly to a dental college, because men have such varied ideas of dental practice. You cannot find two men who are practicing dentistry who have the same ideas as to how a child should be taught. I speak of them as children, because I believe they should enter the study as children, no matter how old they are.

I do not say but what there are a great many men who are practicing dentistry that are thoroughly competent, in every respect to take students into their offices to educate them without their going to a college, but those are not the men who will do it. Men who take students are usually those who have pecuniary interests in view, and for that reason I would be in favor of preventing dentists from taking students into their offices.

Dr. STOCKTON: We live in a busy age; haste is written on every hand, and as some one remarked, it takes but a little while to become a *grandfather* in dentistry. I think it was the Ohio Dental College, a few years ago, that prescribed as a necessary qualification of students that they should know something about the English language before they entered, but the pressure has become so strong that they have done away with that I understand, and have swept it from their books.

New Jersey has upon her statute books a law with regard to the practice of dentistry. There must be an examination before a board of censors and that board understand themselves so well that they reject any young man who comes before them unless he is so thoroughly qualified that they cannot, in all conscience reject him.

If it comes to this, that none can enter our profession unless he is a graduate of a college, in a very short time our profession will be just where we desire to see it, and there is where we must put down our feet, and say it shall come.

Dr. BOGUE: I do not conceive that the multiplication of State laws is going to affect graduates of dental schools. Dr. Taft says

colleges have enough to bear, but in my opinion the public opinion of dentists influences the action of colleges very much. We have never taken a stand which compelled the colleges to adopt a certain standard. One school will have a standard that we might all approve; another will sell its diploma for $25. We have to pronounce among ourselves such an opinion that they may take a different stand from what they now take.

Dr. BUTLER: If men come out with a diploma it should mean something. Diplomas are too cheap; we have too many graduates. I was once accused of disloyalty to the profession because when a resolution was offered in a certain society that we should require a three-years pupilage, to be supplemented by lectures and graduation, I said I would like to offer an amendment that the students should be graduates of a dental or medical school. I would make them to be graduates of both schools, and then they would not have too much knowledge to enter upon the practice of the profession.

I do not believe it is policy to send a raw student to a dental school, I don't care how good the school is. Fault is found with the schools and with the graduates, and yet there seems to be a disposition to multiply the colleges. I wish they were simmered down to two or three, and faculties put in that are good for something, and endowed; give them a sufficient fund to pay for good teachers. It has become a recognized fact that the most successful schools in teaching, and those that have the largest classes and turn out the best students are those that provide ample hospital and clinical instructions. It will not do to put an inferior man there to demonstrate mechanical or operative dentistry. The teaching of mechanical dentistry don't amount to anything. As Dr. Allen said, we are not as far advanced in that department as we were twenty or thirty years ago.

Dr. ALLPORT: A great deal can be said about this question, but the thing is to say something practical. It is easy to blame the schools, but not so easy to suggest some practical plan whereby a thorough education will be more general. There is a desire that dentistry should be regarded as a specialty of medicine, but the present course of instruction in either private offices or colleges is not the best to secure that end. The same course of study should be pursued that other specialists in medicine go

through with; books are studied and lectures attended for three years; and the extra time is devoted to the study of the special studies; and these cannot be pursued until a general knowledge of medicine is obtained. The student of dentistry, on the contrary, simply takes a partial course of reading, and commences work in the laboratory; thus studying a profession and learning a trade all at once. No one expects a trade to be learned in less than three years' apprenticeship. Certainly even mechanical dentistry requires as much preparation as that; and to properly practice all branches, a man must learn both a trade and profession in that time. The study and practice should be divided. Let the mechanical dentist confine himself to that branch, and let the dentist who treats diseases of the teeth become fitted as a medical specialist in a medical college; let him breathe the atmosphere of medical teaching; then we shall have done the same that is done to make ophthalmotologists and aurists. Designate mechanical dentists as you please, but drop the word *dentist* as soon as you can. We may have "dentologist" to designate those who operate on the natural teeth; the others may be called what you please, as "dentificer" or "dentician," but let them be called by different names, and soon they will be so recognized by the public, who will be better served than by the present practice.

Dr. Morgan: I feel entitled to be heard on this subject, for I am the the oldest regular graduate that belongs to this association. I suppose there are in this country entering the profession at least 1200 dentists each year, and of that large number there are about 250 that attend lectures, that go to college. If you can devise any plan to get the students of dentistry in this country into the colleges, it will be a greater advance than we have ever made in five or ten years.

I am free to admit that our dental colleges are not what they should be. Much stress has been laid upon the term of tuition, the time which should be devoted to dentistry before a gentleman should be permitted to go forth to practice his profession. I do not subscribe to the importance of this matter. I think when an individual goes to a dental college and comes up before the proper authorities and passes his examination he ought to have his diploma. I do not care whether it is one year or ten, but I want him to be able to pass his examination, and I would

like to see all our colleges adopt that idea. I think in some of the institutions in this country that is the mode of proceedure. I believe in the medical department of the University of Virginia there are only three professors, and yet a diploma from that institution is the highest recommendation that a man can have all over the broad southern country, because they take their students and examine them at the end of one year, at the end of two years, at the end of three or four or five years, and when they earn their diploma they get it, and they get it on the ground of qualification and not because they have been there a given length of time.

If we can adopt some plan to get the dentists of the country generally, into connection with our associations, it will be one of the means by which we may remedy some of the defects in our education. In the State of Tennessee we have about 250 dentists. About 50 of those are connected with the dental associations. The others are beyond our reach; they do not take our literature; they do not read a single journal; they never mix with the profession anywhere, they stay at home and circulate around in their own circles, squat down in the little towns and we never see them. If we can adopt any plan to bring out that class of men—for I presume it is the same all over the country—so as to bring them in contact with the more advanced in the profession there will be much less difficulty about getting students into the dental colleges and giving them proper training.

We in Tennessee were among the first to adopt a regulation requiring every man connected with the association to pledge his students to at least two years pupilage and graduation in a medical or dental college before they proposed to practice in any other capacity than that of an assistant. We have not lived up to that very well, but it has had a very wholesome effect upon the profession in the State.

Dr. WETHERBEE: Public opinion is arrayed against the rapid and successful advancement of the profession. The larger part of the persons who require dental services are persons of moderate means, and they desire to spend their money to the best possible advantage, and they call upon the first man whose shingle they see, who will do their work for the least money.

We have not sought the public press as a means of communication with our patients. In the second place there are a great many practitioners who have not had a thorough office dental education; I mean they have not been instructed in the mechanical department, and I hold in opposition to the gentleman on my left (Dr. Allport) that you will not be able to divorce the mechanical department from the operative. It may be so in isolated cases but it will not be so very generally.

I know of men not more than 750 miles from here, who 30 or 35 years ago were in the habit of receiving students for a term of three years, the students finding themselves and paying $100 a year, and during all that period of time never were invited into the office or instructed one hour in operations upon the teeth, and I know of one man in practice in Boston to-day who was with his preceptor three years in the mechanical department and never saw a tooth filled, and did not receive one hours' instruction with reference to the method of filling teeth, and yet should that preceptor's name be mentioned, you would, for the honorable position he has held for so many years, award him a meed of praise.

I hold that no reputable dentist should take a student for less than three years, and also that the student should sign a contract binding himself by his honor that at the close of three years he will enter a dental college and graduate.

This, the leading association of dentists is to-day a stumbling block to our advance, and wherein? The association is made up of members who are graduates and non-graduates. We have men who never graduated at a dental college who are able, efficient, and honorable as practitioners, and successful too, but that does not cure the evil, and what shall be done? If you wish to aid them in the work in which they are engaged, change your constitution, and allow no delegate to come here except he is a graduate of a dental or medical college. When you have done this you will have accomplished something which is an example which will affect the whole country and wake men up to a desire to do something.

Dr. McQuillen: In listening to the annual criticisms of dental colleges in our national association, I am forcibly reminded of an utterance of that genial wit and humorist, the "Professor at the Breakfast-table," wherein he says: "When nature

invented, manufactured, and patented her authors, she made critics out of the chips that were left." It takes time, labor, and thought to write a good book, or to found, manage, and maintain a college; but with a breath or a few strokes of the pen slight faults can be exaggerated into great defects, and unfounded assertions of unfaithfulness to duty made without due examination of their authenticity. No one can be more conscious of the shortcomings and deficiencies of dental colleges than those who are managing them, and endeavoring, so far as they can with limited means and inadequate support, to increase their sphere of usefulness. Do gentlemen appreciate the trouble, time, and expense that those who are engaged in teaching are subjected to? Would it not be well if, in addition to criticising these efforts, they would aid in the cause of education by contributing money towards endowing the colleges; or, better still, spend their time and money in establishing and maintaining dental colleges, and thus show the profession how much better they could do the work? Why not criticise private perceptors in their unquestionable failure to perform their duty? For the vast majority of accessions to the ranks of the profession come from private offices. The curriculum of instruction in the dental colleges, in place of being lessened, has been enlarged. Formerly a winter course of four months constituted the annual term; now, in addition to that, in some of the colleges, there are spring and fall courses of lectures, with the dispensary and laboratory open all the year, where every opportunity is afforded for acquiring a practical knowledge of the profession without additional charge to the student. The standard of graduation has also kept pace with this.

Speaking not from isolated cases or a limited experience, but as one who has had every opportunity of observing the men who have attended lectures in the medical and dental colleges in Philadelphia during the past twenty-five years—the class of students entering and graduating from the dental colleges now, instead of being inferior to those of former years, is vastly superior in mental culture, for many of them have enjoyed every advantage in scholastic opportunities in the best universities of our own and foreign lands, prior to matriculating in our institutions. We are told that there should be fewer schools; that four would suffice, one in the east, one in the west, one in the south, and one on

the Pacific coast. Has the gentleman considered the question in all its bearings? Colleges are established not merely to supply the wants of the present, but the demands of the future; not only to educate those who are to serve, in our land, forty millions of people in the present, but five hundred millions in the future. Again, if all engaged at present in the practice of dentistry who need educating, and the yearly additions to the ranks of the profession who come in from private offices without an education, were forced by state laws or an enlightened public opinion to obtain a collegiate education, the dental colleges now in existence could not accommodate them; indeed, with the present facilities, the best arranged institutions in the country could not give that practical instruction which is such an important element in dental education, to more than one hundred students; whereas, on account of the different methods of instruction in medical colleges, five hundred to one thousand men can be taught, in a single institution, the theory and practice of medicine and surgery. If better instruction and increased opportunities for fitting the dental student to enter upon the practice of his specialty could be obtained by combination with medical colleges, I would say, God speed it.

A most melancholy spectacle is presented by some of our fellows who are constantly whining about the non-recognition of the profession. The question naturally suggests itself, is the fault with the profession or the individual? A man of culture, ability, and executive capacity has no occasion to complain of indifference to his rights on the part of others, and it is the influence of such men that gives character and tone to the profession in which they are engaged.

Dr. Crouse: There probably never was a time when the dental profession realized, as fully as at present, how much imperfection there is in the profession.

I can readily agree with some gentlemen that to improve our profession we must improve the materials we bring into it, but I cannot agree with everything that has been said about the superiority of graduates over and above others. It is my opinion today that their average is very little superior to the students outside in proportion to the number, and my observation has been quite extensive in that direction. Indeed, I am almost in-

clined to believe there was something wrong somewhere in the kind of education they have received. I live where we have plenty of incompetent practitioners, and a large per cent. are either college graduates or have attended one course; and there is either something wrong about the material or the education. When men start out and become dishonest from the time they commence to practice, when they associate themselves with the worst kind of mountebanks in the country, I say there is something wrong with the material or with the education, and indeed I have been almost afraid it was in the education.

Several gentlemen have spoken of the sacrifices of professors of dental colleges. I am aware that there are some earnest laborers in that cause—some earnest laborers that make sacrifices, but the very fact that when one college springs up in a city another must spring up, will show that it is a kind of quackery. It is simply one set of practitioners saying to the other, "If you start a college you are just that much above us, and we will have a college and be college professors."

The last gentleman on the floor argues that a dental college cannot educate more than a hundred students. I don't think they can educate a hundred with their present facilities. If I had a student I would not send him to any dental college that I know of. I would give him his education in dentistry myself, and I would send him to a medical college, because I should have a better field to select from than among the dental colleges. I am not going to argue that medical students are turned out much smarter or much better than dentists, because we have a great many mean medical colleges.

To educate a dentist you should do a great deal more than educate him as a manipulator; and this latter can be done a great deal better in an office than it can in a college. If I had a young man to teach how to operate, I would place him at the chair with his patient, and stand over him and tell him where his mistakes were. Can I tell a hundred students, can I tell twenty students a day where their mistakes are?

I don't see how we can expect to be recognized by scientific men until we become scientific. In order to make dentists you must educate them right, and in order to educate them right you must have the right kind of professors and the right kind of pre-

ceptors, and if you have the right kind of material you will turn out something that will be right.

Dr. Atkinson: There is so much involved in the subject of dental education that it is impossible to concentrate into ten minutes a decent statement of what are the requirements. Dental education is really very far off, if we have to go back through surgical, medical and classical to academic education before we can get a proper dental education, finishing with the dental education proper. I am sorry to see a difference made between dental and medical education. Medical education is the basis of dental education. A man who has a dental education has already the elements of a medical education if not the practice.

Much has been said as to the ideal. I have my ideal of what education ought to be, but we have to take things as we find them in this world, and we have to operate with such assistance and appliances as are at our hand or invent those that our necessities squeeze out of us. Who of us knows what the first principles are, and who of us that has come through all the painful labor and anxiety of getting what little education we have, don't know the difficulty that lies in the way? Scarcely any of us know all the difficulties; if we could but recognize them as they arise we would be much better endowed, and possibly we would get them out of the way. If we were required to produce a voter for our government instanter, twenty-one years old, with a nice beard on, I don't know how it could be done. We will have to go back to the good old way and begin right, and very likely it will come out right.

How are we now as a dental profession, and what are our requirements? The history of dental colleges has been somewhat touched upon, and it has been truthfully stated to-day that the mother did not know the babe and did not recognize it, and it had to grow up alone, and has grown up alone, and has become so large that now, in the presence of the courtiers, it attracts more attention than its mother, and she is jealous. That is the square statement of the case. I have seen the same in families. They say the French women are very hard on their daughters, that they look better at 40 than the girls at 20.

I think that is just our fix exactly. It is because of the mechanical aspect of dentistry, like surgery, that enables us to per-

ceive distinctly when we have coincided with law, and when we have opposed law, and therefore the impression is more clear and distinct whether we have done good or evil. Here is just the difference between us and medicine. Medicine makes mistakes and the grave covers them beyond the perception of the keenest mind. The poor self-sufficient iconoclast that we intrust, ruthlessly tears valuable organs from their location, puts them out of the way, and after we find out the difficulty of replacing them, it is apparent that they had infracted law, and they cannot amend it. That is the reason why we have so much distinction.

I am with and against every man that has spoken. I am with him as far as he comes to my perception of the truth, and when he don't come to my perception of the truth I yearn to illuminate him, because I know I have the truth. Now, ain't we the gentlemen and ain't they the bores, ain't we the christians and they the vandals the world over? I don't care where you go you will find that law the same. Then who is the judge? Be the judge yourself, and be honest in your judgment and you are safe every time. For when you find you have made a mistake, you do not want to be fooled again. You do not like that kind of food at all. What is education? It is mental feeding, and nothing else. It is simply knowing what kind of food to eat, and if you know that which you will digest well, you will easily govern that taste.

About this diploma matter: sometimes I have said I wish there were no such thing as a diploma anywhere. If there must be diplomas, do have them say what they mean and mean what they say.

Who endorse and who are the endorsees? I can see many persons in this room that have papers who never attended a single course nor a single lecture to get them, and yet they are worthy of them; but they do not go through the right way, they say, whatever that is. If it is held up as a support of the method of education that has been finished by the granting of a diploma, it is an error and a mistake.

The brave men who made themselves worthy according to the self-educating system spoken of by Dr. Allen, did they make themselves worthy? No, the blessed love of the fountain of life made them what they are, and let them forget their egotism and

remember that all that they know was received at a time when they were in a receptive condition; when they had been so hungry to know, when they had reached out with that ardent desire, the divine grace came in and illuminated their understanding and revealed to them the truth. It ought to breed humility, and it ought to teach us that when we have been thus stall-fed, we may go back to the crib again and never say that we do it ourselves. Self education, as intended by Dr. Allen, we don't commend very highly, but we get self education only, in the sense that we breathe, when we can't help it. When we get very hungry for a breath we take it. Just so when we want education very ardently, we get it. As Dr. Morgan said, when there is a will there is a way, and we shall find it out. Then if you have diplomas, have them honestly obtained.

I have repeatedly said, sometimes before this body, and sometimes before other bodies, that I wish there were nothing but certificates of advancement, and the reason I say that is this: to graduate us to any standard which has been attained yet, will only leave us babes. We are not complete even in our best apprehensions of what ought to be and what will be requirements. Diplomas, as a rule, are a damage to a man that holds them, for they entrap him into the idea of thinking that he has been recognized, and now he has finished. That was not the intention of a diploma. It was simply an admission fee to the show, that is all. It is an admission fee into the atmosphere of observation, whereby he may be so intently engaged that the divine grace can come into him and obsess him throughout and make him luminous, that he may have light in which to perceive the truth, and then he will embrace it, for there is not a sinner on the earth that is so bad that he will go the way of darkness by preference, the whole pulpit to the contrary notwithstanding; and I am a *pulpiter*, too!

Then what shall we do in educating in great masses, as they do at the colleges? As to the differential education between dentists and the other world, I am not ashamed of the meanest outside dentists as compared with the meanest outside medical men anywhere, and if they make a difference between the medical men and dentists, I will cast my lot with the dentists. They have more genuine earnestness and goodness than the medical

men, take them as a class. Then how shall we get education? Education comes from an old Greek word. Sometimes I wish we could begin anew and have a new deal, and not go to the Greeks and the Latins and all the rest of the jargons. Does any one know that the middle partition wall is broken, and that the veil is rent in twain from the top to the bottom, and not from the bottom to the top? It was rent by that which came from without the human sphere; it came from without and entirely independent of the souls of men—from the top to the bottom.

Then how shall we get our education? By honestly seeking it, irrespective of how much it will cost. Although we claim to be christians, we are almost to the last man of us trying to buy cheap and sell dear. When we get that out of the way, we will be very well able to understand what education means. *E*, out of, and *duco*, to lead, a hybrid, a mule—*E* Greek and *duco* Latin —a Greek-latin mule that we are riding on. It is no wonder we are tipping over the fence first one way and then the other—half milk, half water. Duco—to lead out of. How did we get in?

Give me hungry students, and I don't care how many of them are in reach, as far as I can talk to them and see them, I will talk to them just as well as I can, but what we need is conversation —soul to soul communion, mind to mind interpenetration—just like this interpenetration of gases the people know so little about—until every one shall be satisfied and says yes—not that old nasty skin of the teeth yes, but one that comes from the bottom all the way up, and you feel that they see through the answer; so that when we know that the enquiries that arise in our minds are satisfied we are educated, and not till then.

Dr. Osmond: A great deal has been said about the poor compensation which professors of dental colleges receive, but it is very strange that there are so many who glory in the title of professor—pay or no pay; they like a handle to their names, and there are many who aspire to that degree who illy deserve it. I am in favor of a national board for the examination of students, and also for the examination of those who aspire to be professors.

How are the schools formed? A coterie of men get together and agree to have a college; a charter is very readily obtained,

and a board of trustees is appointed. The professors are not appointed by the board of trustees, but the trustees are appointed by the professors. That does not appear on the surface, but it is nevertheless done. In short, as a general thing, the board of trustees is simply a farce. Capital may be required, and all the money that can be secured must, as a matter of course, be had. The professor is not compensated, but he stands before the public as a professor and receives better fees in consequence. The next thing is to secure students. A circular is issued, and very frequently some honorary degrees are given to practitioners, in order to encourage them to send their students to this institution. Some of the colleges maintain their character, and some do not. In some the stock goes up, and in some the stock goes down and is bought in by men who aspire to the honor of professorships, in order that the stock being controlled by them, they shall be everlasting professors in that institution.

With regard to diplomas: the question is frequently asked, "What did you give for that diploma?" or it is said, "He bought his diploma;" and unfortunately it is so in many cases. Let the diplomas be given to those who deserve them, and be given without price, so that they shall be above suspicion. I would not have the professors examine the students, but they should be examined by a board. If the general government were to examine all professors by the same board, if you will, that examines the students, there would be an end to men having professor attached to their names who know nothing.

I here state, and am prepared to prove, that some of the worst quacks that ever infested our city or any other, are graduates; laughing-gas quacks, rubber quacks, etc. I know of one party who graduated after a session of three weeks, who never pulled a tooth in his life until ten months before, who runs a laughing-gas establishment, and who in four months was seen selling twenty-one pennyweights of gold which he had taken from teeth he had extracted. Over all such shops should be written Dante's motto: "All hope abandon, ye who enter here," for they simply purpose to destroy the natural organs instead of preserving them.

Dr. WATT: I am now not connected with any college. I was once connected with a dental college, in the first place as a

student and then as a professor, and I know that in that institution great care was taken to see that the students gave evidence of good moral character, manly disposition, etc. Some of them proved derelict afterward. I do not think there is an institution in the world, professional or classical, that has not had the same experience. Some of the older members of the profession will recollect, that for one year, the lists of questions were printed, and the students had no opportunity of knowing what questions would be presented to them. The examination was conducted in writing and occupied thirty-two and a half hours to each student, and the requisition was that a failure of more than twenty-five per cent. in one department and twenty per cent. in the other passed the student back and rejected him. That was the most rigid rule I knew in that institution.

Dr. REHWINKEL: Dental colleges have been very severely criticised; but have we asked ourselves the question whether we do our duty as a body and as educators. Do we fulfill our mission in our societies? Many members go away from our societies disappointed, although it cannot be denied that an immense amount of good has been done by associative effort. In fact, I believe that that alone has been the means of bringing up our profession to that standpoint which it now occupies, yet if such an important subject as dental education is spoken of, I believe it behooves us that we should closely examine into the proceedings of societies and into the manner in which we conduct business, and see whether we fulfill our mission in this respect. Are we each and every one of us teachers in the true sense of the word? Circumstances always modify cases, but that at some future day a different course will be pursued by dental colleges, can scarcely be doubted. Dental colleges have been made to see that where they have given good grounds for disappointment to the profession at large, the profession, on the other hand, has been made partially to see that they have failed to support and sustain and encourage dental colleges.

It has been alluded to here this morning that private preceptors have been sadly remiss in their duties towards sustaining colleges, and toward preparing young men for entering colleges. It is generally presumed that if a young man enters a university, a preliminary education, whether general or special, should

have been to a certain extent given to him, so that the college could build upon a foundation laid by the preceptor. Is that really the case? Are not our colleges obliged to go down and commence at the very foundation, and in many cases to insist that the student must unlearn what he has learned before he can learn what he is required to? In Europe the question has received large attention, especially in Germany, and opinion there is very much divided on the subject. One class insists that the dentist shall go to a medical college, in other words, that he shall be an educated physician before he shall become a dentist, and this is really the only way in which a thorough education in Germany is obtained, unless it is by private tuition. Hence there is a very exact distinction made there now in an assembly such as this. The lines are drawn so tightly and so sharply, that if gentlemen get up to speak, those who possess the title of "Dr.," for instance, and who claim it and use it, and allow it to be used only when they have a diploma from a medical college—these men will be called "Dr. A.'" or "Dr. B.," and right alongside of Dr. A. sits *Mr.* C., perhaps just as good a dentist and operator, and perhaps equally well educated in other respects; still there comes in a sharp distinction, and cuts him right off. That is one of the peculiar features of that country. In discussing the matter one class condem the American system. They insist upon a general medical education. Others again, especially those who have a more extended and thorough knowledge of the educational departments of this country, hold up to them the advantage which the special American schools of dentistry afford, and point, perhaps with a great deal of truth and a great deal of force, to the fact that as far as accomplished manipulators and operators are concerned, American dentists are far in advance of European; but they also claim that as far as real scientific attainment and education is concerned, they stand upon the same level, if not a little higher.

Dr. HORTON: Upon this subject of education I do not feel that we ought to criticize each other too harshly, except in the spirit of utmost liberality. It is said Daniel Webster, on the occasion of his graduation, supposing himself to be the best scholar in his class, and not receiving the highest honors upon the platform where he received his diploma, tore it up and strewed

it on the floor, and in the face and eyes of the faculty, declared that he would not carry that certificate through life to build upon as a foundation; but that he would build upon his own foundation, and he did.

It is not absolutely necessary that any of us have a diploma or a certificate. If we have it in us and have the knowledge, we need not fear that we shall not be recognized wherever we are. As Dr. Atkinson remarked this morning, I am willing to stand by the dental profession everywhere. I will go into any community in the United States of America and select the dentists, and submit it to the candid opinion of the community whether they do not stand favorably, as men and as professional men, as compared with the medical profession.

Dr. JUDD: I wish first of all to speak of this question in connection with our being a specialty of medicine. As I have stated before, if we are not a specialty of medicine, I would like to know what we are. If we belong to any profession, I would like to know what it is if it is not the medical profession. I apprehend that there is no necessity of carrying this line of thought any further, but I wish to speak particularly as to the question of whether or not we are acknowledged as a specialty of medicine as far as we really deserve; whether we have been treated by the medical profession as we deserve to be treated. I have some views upon the subject different from those that have been expressed by other speakers, and it seems to me when we take a fair view of the subject we have really no right to complain. The National Medical Association require that their delegates shall be medical men, that they shall be graduates of medical colleges, and if the American Medical Association should see fit to send a delegate to this body who was not a practicing dentist, we should most certainly reject him. It is true that there are a few medical journals in the world, such as the London Lancet and the Philadelphia Times, that have sought upon certain occasions to throw some discredit upon the dental profession which it does not merit. But I apprehend that the great body of physicians recognize the dentists to the fullest extent they have a right to demand. They do not recognize them all as polished physicians, because if they did they would make a mistake. They are exceedingly anxious that we should educate ourselves

generally, so that we should stand upon the same footing as aurists, occulists, and other true specialists of medicine. If we desire to be recognized as specialists of the medical profession, we should first make ourselves such. If we desire to occupy exactly the same position that other medical men occupy, we should educate ourselves as other medical men are educated, and it appears to me the best way to do this is in a medical college. The medical profession appropriate as teachers all of the best materials, and if we desire to have the benefit of those teachings, so far as the medical part of a dental education is concerned, we must get it where the best teachers are employed. Again, if there is a prejudice between the medical men and the dental profession at this time, how shall we eradicate this in the minds of the medical men better than by allowing our students to sit side by side with them in their colleges, and particularly side by side with them at their examinations, and show beyond all peradventure that they are their equals?

In relation to the dental colleges of the United States, I want to say that I believe they have done a great work, but that they are all what they ought to be I shall not affirm. I think this discussion will have a great deal to do in shaping the future course of some of the colleges, and will undoubtedly improve them all, and I hope this association will keep a close eye upon all the dental institutions of learning in this country, and that it will finally control them. Undoubtedly certain schools are kept up for the purpose of benefitting the professors and immediately surrounding dentists, and therefore I say that I hope that the final control of all institutions of learning in the country will be with the profession at large.

REPORT

ON

Mechanical Dentistry.

By E. D. SWAIN, a Member of the Committee.

AS one of the members of your committee on mechanical dentistry, I beg leave to offer the following: As to improvements during the past year there is nothing of importance, and the new things which have been introduced during that time have proved of very little value, or utterly worthless. Of the latter class vulcanizable gutta-percha has proved perhaps the most signal failure.

The various metallic alloys which have been introduced from ime to time, have not interested the profession to any great extent, and therefore have failed to come into general use.

Rose pearl, owing to the complicated method of its manipulation, has not grown into that general favor which was anticipated for it. The material itself, in its improved form, appears to possess many of the properties necessary for a good and durable base. A plate of this material inserted by myself more than a year since, in a mouth where great strength was required, as yet stands perfectly, far better than rubber had done.

Celluloid, because of the ease and simplicity with which it is manipulated, and the non-existence of a royalty in the form of a license, has grown greatly in favor, and is quite extensively used especially throughout the western states. During the past year this material has been greatly improved. It is now prepared from hemp, first made into tissue paper, which is subjected to the action of acids of tested strength, for a given length of time, kept in constant motion by machinery, all parts being thereby

acted upon at once and alike, thus securing an evenness of texture never before acquired. This effectually prevents the flakiness which was so prevalent in the plates prepared one or two years ago. This material has also been greatly improved in color, and the coloring materials used are less liable to oxydize. When directions are followed with the use of the steam apparatus, there is no liability to crawl or warp, or of the pins pulling out of it; finally, it must be admitted that this material alone, of all the new ones introduced to the profession, seems to meet with most encouragement, and the present prospects are that it may, when further improved, supersede rubber altogether; being quite as strong, conveying far more accurately the impressions which heat and cold produce in the mouth, besides giving, when properly manipulated, better adaptation to the parts.

Aluminum, which at first promised so much as a base for artificial dentures, possessing, as it does, so many desirable qualities, such as lightness combined with strength, perfect conductivity, &c., has, by practical experiment, been found to lack one of the most necessary qualities, viz: durability. While it readily withstands the acid secretions which may exist in the mouth, it is readily destroyed in a mouth with alkaline reaction. Therefore in a large per cent. of cases where inserted, it has been rendered utterly worthless in from a few months to three years. The first indications of failure with this metal are blister-like spots upon the plate where in contact with the mucous membrane. Upon breaking into these blisters, they are found filled with an earthy deposit; if this be removed it will be found to have either very nearly, or entirely, perforated the plate; by this means holes first make their appearance, which, like a vitiated ulcer, spread rapidly, soon rendering the plate worthless. This has been my experience with all swedged plates of this material. Regarding cast plates I cannot speak, having had no experience.

It has been suggested to me that the earthy material found in the blisters mentioned, is the result of imperfectly manufactured material, and that the residue of kaolin has not been entirely cleaned from the metal, and this may be the case. I have, however, experienced the same difficulty with plates [constructed from carefully re-refined aluminum. If it can be proved that the failures with this material arise from impure or imperfectly manu-

factured plate, we have a metallic base which in many respects is superior to all others.

The many objections to rubber are too well known to this body to require a recapitulation here, though it may be safe to assert that the greatest is evidently the royalty we are forced to pay to the Goodyear Dental Vulcanite Company. Many of the other objections urged against this material can, however, be overcome by the use of the black rubber, which is lighter, possesses greater strength, and not containing vermillion does not produce that tenderness of the mucous membrane, sore throat, etc., so prevalent where the red rubber is used.

I have nothing to report concerning continuous gum, or gold work, further than that both are as reliable as ever, and are the cheapest in the end of all bases yet discovered.

Of improved machinery for the laboratory, I have to report only the steam apparatus for working the celluloid, which is in every way superior to and more desirable than the old method with oil; and Hopkins' regulator for vulcanizers, which effectually does away with all danger, besides saving much time and anxiety on the part of the workman. This machine is attached to the top of the vulcanizer in such a way as to regulate the flow of gas, and never allow the temperature to rise above three hundred and twenty degrees. Connected with it is a clock-work attachment which turns off the gas after the case is vulcanized, at any desired length of time.

I desire to enter a protest against that portion of last year's report, made by Prof. Eames, advising a separation of the mechanical from the operative or surgical departments of our profession Or more particularly, that in our dental schools it should be left entirely to the student to say whether he shall become proficient in this direction or not. It was admitted that students were graduated without their being able to pass a satisfactory examination in this branch of the profession, and that the professor of mechanical dentistry, in signing the diplomas, knowingly certified to what he knew to be false. It is my opinion that there is at present a very wide field for improvement in this branch of our profession. The number of articles which have of late appeared in the journals devoted to our interests, upon improved methods for setting pivot teeth, plainly indicate a growing desire

for improved means for replacing the teeth when lost. The continued experiments, by members of the profession, for the purpose of discovering a material possessing all the virtues of vulcanite with less or none of the objections to it, and the avidity with which a new material promising these improvements is experimented with, also show that we as a profession are dissatisfied and anxious to improve this branch of our calling. Assuming these statements to be true, I can see no good reason why our dental schools should just now endeavor to throw obstacles in the way of its advance, or should desire to relieve themselves of any part of the odium at present attached to the mechanical department of dentistry.

If, as has been stated, at some of the association meetings during the past year, "advancement in operative and surgical dentistry has ceased" for the time being, then we hope the time has arrived when those men who have used all their talents in that direction, will look about for the means to elevate mechanical dentistry.

The two branches cannot be separated by the general practitioner. Isolated cases may exist, and no doubt do in large cities where the one may be practiced independent of the other, but even in these few cases the operative dentist is called upon to correct irregularities, insert pivot teeth and perform other operations which require the highest order of mechanical ability. That time will never arrive when the dentist with a country or small town practice can separate the one from the other, and the college which sends a graduate into the field incapable in this direction, is not only doing the *individual* injury, but possibly an entire community. The profession has experienced little difficulty in educating themselves, as well as their patrons, to appreciate a better and higher class of operations upon the natural organs, as well as to a higher remuneration for such services. An equal ambition to excel in the mechanical department, the same unity of purpose to elevate, with a more thorough and determined stand in our schools, would soon make an exhibit in this direction of which we should feel proud.

Mechanical dentistry is not to be elevated by being made a specialty. I believe the man who operates upon the teeth of a family for years, is the one best calculated to provide the substi-

tute when required. Knowing as he must all the characteristics of the natural organs once possessed, as well as the expressions of the face and mouth, with natural organs intact, he is best fitted to reproduce them. Neither is it to be elevated by being left entirely to the student or the boy who may be employed to sweep the office and do the dirty work of the laboratory.

But those men who pride themselves in their ability to restore a defective natural organ to its original form with metal, as well as the teachers in our schools who claim to place the young practitioner upon the road to fame and fortune, these are the men who by their precepts and works must set the example and thereby elevate or resurrect this almost dead arm of dentistry.

In short, it must be elevated by what is taught, instead of a neglect to teach those entering the profession.

REPORT OF THE

Committee on Appliances.

THE committee on dental appliances beg leave to submit the following hasty report of such new and improved articles as have been presented for their consideration. They have had little time for examination, and therefore propose to do little more than merely mention briefly the names of such appliances, leaving their merits or defects to be brought out by discussion.

Ransom's vulcanizer possess the new feature of a self-packing arrangement and a gravity safety valve, both of which commend themselves by their simplicity and their probable effectiveness.

A floss holder for the pocket, for office use, presented by Codman & Shurtleff, seems to be worthy of notice and adoption.

Johnston Bro.'s present an instrument for separating teeth, the invention of Dr. O. A. Jarvis, of New York, which promises to be a valuable adjunct in operative dentistry, doing away with much of the inconvenience of the usual system of wedging. They also present a little tongue and cheek protector, invented by Dr. Ives, of New York, designed to be used in conjunction with the corundum discs. We are of the opinion that it may be very useful in many cases.

The same firm present separating files made with a corrugated handle, enabling them to be held between the fingers with greater ease and steadiness.

They also present a set of rubber dam clamps, designed by Dr. Delos Palmer, of New York, which are ingeniously adapted to the purpose. Something of this kind is of course indispensable to the best use of the dam.

A triplex arrangement of hollow punches, suggested by Dr. F. W. Dolbeare, of Brooklyn, for use with the rubber dam, can be commended as simple and very convenient.

Dr. E. Osmond presents improved retaining screws for securing fillings. They seem to possess advantages over the ordinary screw in having a head that may be split and bent down upon the filling. The driver, which is supplied with the screws, is also improved over that heretofore made.

A set of four scalers, presented by Johnston Bro.'s, were examined by your committee. We deem them a useful little instrument for the purpose intended, and think them worthy the attention of the profession.

Dr. Canine, of Louisville, Ky., presents three forceps, two of which are for the inferior molars, one of these being of the style called the "Cowhorn," the third instrument being for the extraction of superior molar roots. These forceps seem to your committee to possess considerable merit, and we think will prove useful in many cases where other forceps for the same purpose may fail, yet there may be some improvement still made upon them, and such improvements the inventor assures us will be made; his samples having been very hurriedly constructed, they hardly do justice to their devisor.

A variety of burs, both for the straight and back-action hand piece of the Morrison engine, were presented by the same party. These your committee gave a pretty thorough trial, and unhesitatingly recommend them as being of fine material and excellent temper.

A variety of excavators, also presented by Dr. Canine, were brought before us and receive favorable mention, and should the manufacturer continue to make them as well as the samples presented, we think that they will be found to merit the confidence of those using them.

A variety of polishing stones, to be used with the dental engine, were presented by Dr. Baxter. These having been seen and used by most dentists throughout the country, we can hardly consider as new. We would advise those who have not done so, to get them and give them a trial, for they very perfectly meet the design for which they are intended.

Dr. S. C. Taylor, of Toledo, O., presented for our consideration and examination his new process for packing rubber in the manufacture of artificial plates. This we consider the very best means thus far devised for this purpose, and it only seems strange that so simple a mode should have remained so long undiscovered. The object intended to be gained is to so pack the rubber that when the flask is ready to be placed in the vulcanizer, there shall neither be a surplus or a deficiency, and this end we think will be fully accomplished by the process of Dr. Taylor. To give a full description of his mode would take more time than is at our command. Those wishing to further examine into its merits are advised to confer with the inventor and patentee.

S. S. White has presented before this committee the following articles for examination:

1st. White's engine. This upon examination we find to be a very valuable improvement as regards the pitman and flexible arm; the first being a steel spring which works very noiselessly and smoothly, never stopping upon the center, while the flexible arm allows a most perfect control of the hand-piece in operating.

2d. White's hydraulic lift as attached to the Harris chair. This improvement seems to work very smoothly and with little noise, and accomplishes the end desired with very little effort.

3d. White's air cushion in back of chair. This has its merits, but to your committee does not seem entitled to especial commendation.

4th. The same inventor also presents for our consideration and examination his changeable seat and extension back rest, both of which must be seen to be appreciated.

5th. A vulcanizer so designed that it may be set to run at any given pressure of steam, and once having been set will not vary from that point. This improvement we commend to your favorable notice.

6th. Green's electric engine as improved by White, which we most heartily recommend to the dental profession, or such of them as do not employ an assistant at the chair. Time forbids a protracted explanation of its merits.

Your committee have had their attention called to the Bonwell electro-magnetic plugger, and have seen the same in operation. It is a beautiful instrument, and to be appreciated must be

seen. It does its work well, and their seems to be no deficiency in power. As to whether the *noise* caused in its running would be an objection, we are not prepared to say.

S. S. White also presented some hard rubber disks to be used in the polishing of proximate cavities, that are highly spoken of by those that have used them, and we commend them to your notice.

Dr. H. M. Edson, of Toledo, presented to your committee for their examination an improved vulcanizer, the principal feature of which was an arrangement by which the flasks may be brought together after being placed in the vulcanizer, and the top screwed down. This is a very neat device, and it is so arranged that there shall be no strain come upon the bottom of the boiler during the operation, it being obviated by the flasks being set in a stirrup which is drawn up by the screw packer towards the top of the vulcanizer when the pressure in the boiler stands at eighty-five pounds, by a few turns of the screw, and a more perfect closing thereby.

GEORGE L. FIELD,
G. R. THOMAS,
ALBERT H. BROCKWAY, } *Committee.*

VOLUNTEER ESSAY.

Asphyxia from Chloroform,

By J. DOUGLASS.

Romeo, Mich., November 20, 1857.

DR. C., an eminent physician, came into my office and said to me, "I have made up my mind that I must either lose my wife or consent to her taking chloroform to have her teeth out; her health has been failing for the last two years in consequence of continual suffering from facial neuralgia; she has palpitation of the heart, though I think it is caused by nervousness. However, I do not wish you to be biased by my opinion; act your own judgment in the matter; I may be influenced by over-anxiety." I said, "Bring her in, and I will decide after due examination." In a few minutes he returned with his wife and a lady friend. Mrs. C. was about twenty-eight years of age, had been married five years, no children, had very light brown hair, light blue eyes, fair skin, nervous temperament. Examination revealed no organic disease of the heart, lungs were good, and aside from an extremely nervous condition, she seemed a fit subject for an anæsthetic. As there appeared to be no prospect of improvement by waiting, I proceeded to give her chloroform. When she had taken nearly enough to go into a sound sleep, she suddenly became excited with uncontrollable fear. The chloroform was suspended until its effect had passed off, when she asked why I had not extracted her teeth. I replied, "I told you that if you would trust yourself in my hands I would not hurt you, but I saw you had no confidence in me; I do not want to

give chloroform to any one who cannot confide in me." My reply had the desired effect; for she said, in an unmistakable tone of voice, "I have as much confidence in you as in any one with whom I am no more acquainted; will you not give me any more?" Said I, "Yes, if you can trust me." "I think I can," she said in a very firm tone, whereupon the chloroform was resumed.

She breathed it easily as before, and everything went on pleasantly, as before, until she arrived at about the same stage, when she became excited as before, and said, "I am afraid you will hurt me." "No, I won't," said I, firmly, which seemed to remove all fear; then all went on well till she appeared in a proper anæsthetic state; but immediately when I attempted to extract a tooth she commenced to scream at the top of her voice, and before I could seize another, she resisted with both hands. I gave her two or three breaths more of chloroform and removed another tooth, but with the same out-cry and the same resistance. I gave two or three additional breaths and extracted a third, and proceeded in this manner until seventeen had been extracted; I then said to the Doctor that if he would hold her hands I would repeat the anæsthetic but once more, and then extract the remaining three—not thinking it advisable to continue it longer, although the pulse was good in the wrist and neck, ranging from fifty to sixty. She continued screaming during the entire operation, and about half a minute after it was completed, then falling into a sound chloroform sleep, which lasted about a minute and a half, and during which her breathing was easy and pulse sixty. She awoke of her own accord, and asked, "Where is the Doctor?" and turning toward him said, "Oh! here you are!" In a few moments she asked me in a clear, distinct voice, "Are the teeth all out?" Not thinking it would do any harm, I replied in the affirmative. The moment she comprehended the fact, a perfect relaxation occurred. The lower jaw hung down, the eyes partly closed, a deathly palor spread over her countenance; she ceased breathing, the pulse in the neck and wrist were gone; to all appearance she was dead. Before administering the chloroform her dress had been unfastened and covered with a napkin; a glass of cold water was standing on my operating case, and a bottle of ammonia ready for use; the moment

the change in her countenance occurred, I threw a part of the glass of water in her face and part on the naked breast. I then made use of the ammonia, but it was all in vain—she had ceased to breathe. Just then flashed across my mind a discovery once made while using Davis & Kidder's electro-magnetic machine in a case of rheumatism of the intercostal and abdominal muscles. I found that placing a pole on either side directly under the arms and opposite the edge of the diaphragm, caused a violent beating of the heart and a deep, hurried breathing. I said to myself, "It is just what I want!" and sprang for it as for life. It was standing on a table about fifteen feet from my operating chair, the cords wound around the handles and placed inside the box, the crank unscrewed and inside the box also, and the box locked.

While her lady friend and her husband were weeping over their bereavement, I put the machine in order and commenced turning the crank, when suddenly, with the first revolution, the pulse reappeared in the neck, and with it a deep triple sigh; in a few moments her eyes opened—she that was dead lived again. I say dead, for from the time the relaxation occurred, till the application of electricity, there was no sign of life.

In ten minutes from the time I told her the teeth were all out, she was standing by the stove not aware that anything unpleasant had occurred, and remarking that she felt better than she had before during the past three months.

CAUSE OF THE PHENOMENON.

Any stimulant serves as an antidote to chloroform to a greater or less degree, according to its nature, whether it be medicinal or mental. In her case it was the mental stimulant *fear*, preventing the more perfect anæsthetic condition which might otherwise be obtained, without reducing the pulse to a perilous condition. When I answered her question regarding the operation in the affirmative, it was like removing the last prop from a scaffold—the stimulant was removed, while without it she had a sufficient amount of chloroform left in her system to carry her into the land of forgetfulness. The interposition of electricity induced action of the heart and lungs, and kept them in operation until it was no longer needed. This lady is still living, having survived her husband many years.

[The Essay continued with an account of another and somewhat similar case of resuscitation by means of the battery, and closed as follows:]

Having seen many articles on resuscitation from anæsthetical asphyxia, and not having learned that electricity had been used for that purpose previous to the time mentioned, or applied in the same way since, I could no longer let my diffidence prevent me from reporting these cases.

COLUMBIA UNIVERSITY LIBRARIES
0062041827

COLUMBIA UNIVERSITY LIBRARIES

This book is due on the date indicated below, or at the expiration of a definite period after the date of borrowing, as provided by the library rules or by special arrangement with the Librarian in charge.

DATE BORROWED	DATE DUE	DATE BORROWED	DATE DUE
	JUN 8 - 1956		
JAN 17	1957		
C28(955)100MEE			